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INTERNATIONAL RAILWAY CONGRESS ASSOCIATION.

INQUIRY INTO QUESTIONS OF IMMEDIATE INTEREST.

(Decision taken by the Permanent Commission at its Meeting held on July 29th, 1933.)

QUESTION II.

« The World Crisis and Railways

and the effects of the crisis on railway working; measures taken to lessen the effects of the crisis; competition or collaboration between railway and road transport; a forecast of the future; new ideas as to passenger transport, such as light quick trains between large towns and between large and small towns, running at regular intervals. »

SECOND REPORT

(Main-line railways affiliated to the International Railway Union)

by Dr. COTTIER,
General Secretary, Swiss Federal Railways,

and Reichsbahndirektor von BECK,
Member of the General Management of the Deutsche Reichsbahn Gesellschaft
(German State Railway Company).

FOREWORD.

As a result of the decision taken by the Permanent Commission on the 29th July 1933, the two reporters mentioned above were asked to draw up, in 1934, a preliminary report on : « The World Crisis and Railways ». This report appeared in the December 1934 number of the monthly *Bulletin* of the International Railway Congress Association.

The present report cannot deal again in detail with all the steps taken to overcome the railway crisis and mentioned in our first report. As far as road motor

competition is concerned, this second report must limit itself to the events noticed since the publication of the first report. The latter was only able to deal with the development of the economics of the world up to the end of 1932. To form a judgment on the modifications in this situation and draw up the first report, the statistics for 1933 and 1934 were available. The present report gives in a summarised form a general view, for the years 1929 to 1934, of the development of the economic crisis and its effect upon the railways.

The enquiry has been extended to cover a great many other countries and railways; it has also been completed by ample information from economic and railway statistics. Some of the information relating to 1934 is only provisional, in view of the fact that at the time the report was drawn up, the definitive figures for some companies were not yet available.

CHAPTER I.

EFFECTS OF THE ECONOMIC CRISIS UPON THE RAILWAYS.

I. — The economic crisis from 1929 to 1934.

The world economic crisis, which had become more and more serious since 1929, remained stationary during 1933 and 1934; in some countries there was even a slight improvement. While some of the economically important States, such as France, Belgium, Holland, and Switzerland, are still in the depths of the depression, and others, such as Italy and Austria are beginning to climb out of it, several countries, Germany, England, Sweden and Japan for example, report a great improvement in their economic position during the last two years.

The fluctuations noted since the beginning of the crisis are shown in the following table :

World quantitative production.

(1929 = 100).

(Figures taken from the Monthly Statistical Bulletin of the League of Nations).

Year.	Industrial world production.	Coal.	Lignite.	Pig iron.	Unmanufactured steel.
1929	100	100	100	100	100
1930	90	91	84	81	79
1931	81	80	77	56	58
1932	72	71	72	40	42
1933	81	74	73	50	56
1934	90	81	78	63	68

World industrial production, which in 1932 was only 72 % of that of 1929, has improved to 81 % in 1933, and again to 90 % in 1934; consequently during these last two years, it has recovered by one quarter from the low level reached in 1932.

The industrial production, for each country was the following :

Industrial production.

(1929 = 100).

(Figures taken from the Monthly Statistical Bulletin of the League of Nations.)

—	1929	1930	1931	1932	1933	1934
Germany	100	90	73	61	69	85
France	100	101	89	69	77	71
Italy	100	92	78	67	74	81
Austria	100	85	74	64	66	72
Belgium	100	89	82	69	71	70
Netherlands	100	91	79	62	69	70
Great Britain (1)	100	92	84	83	88	99
Denmark	100	108	100	91	105	112
Sweden	100	96	84	79	82	100
Norway	100	101	78	92	94	100
Hungary	100	92	86	74	81	95
Czechoslovakia	100	89	81	64	60	66
Poland	100	82	70	54	56	63
Japan	100	95	97	102	118	126

During the crisis years, industrial production suffered a more or less serious set-back; for most of the countries given in the above list this set-back was most marked in 1932. After this date, in most States a marked industrial revival is to be observed; it is true that the extent of this revival and the volume of production at the present time differs much from one country to another. The countries in which industry has picked up most strongly during these last two years are Germany, where production in 1934 has reached 85 % of the 1929 level, England, Sweden and Norway where it has already reached the figures recorded before the crisis and finally, Denmark and Japan where the figures have even been exceeded. On the other hand, in France, Belgium and Holland industrial activity is at a standstill.

This industrial revival can be discerned in the evolution of unemployment in the various countries. In 1933 and 1934, unemployment dropped in Germany, England, Denmark, Sweden and Japan; it remained stationary in Italy and Austria; however, it has further increased in France, Belgium, Holland and Switzerland. It must, however, be pointed out that in the countries where unemployment has increased, the decline in trade has not been so great as in those which are coming out of a very severe economic crisis.

Whereas, from 1929 to 1932 the decline in world production and world trade was approximately on the same scale, the volume of trade has remained practically unchanged since 1932 in spite of the great increase in world industrial production. If production and trade have developed on different lines, as the following table proves, it is *because the present trade recovery is practically entirely internal and has not been sufficient to influence international trade.*

Year.	*World quantitative production.*	*World quantitative trade.*
	(1929 = 100).	
1929	100	100
1930	90	93
1931	81	86
1932	72	74
1933	81	75
1934	90	76

The decline in world wealth is becoming more and more marked; the proof is the disastrous falling off in world trade.

(1) It should be noted that in Great Britain the economic crisis began before 1929.

World trade.

(Imports and exports, in millions of Swiss francs.)

Year.	Europe.		Countries outside Europe.		World trade.	
1929	180 176	100	132 264	100	312 440	100
1930	153 972	85	96 705	73	250 677	80
1931	115 168	64	63 796	48	178 964	57
1932	76 695	42	48 194	36	124 889	40
1933	69 024	38	43 768	33	112 792	36
1934	65 140	36	42 536	32	107 676	34

In view of the deep modifications that have occurred since the war in the economic system of the various countries and the ever increasing barriers the States have raised, for economic and financial reasons, against international

TABLE 1.

Foreign trade (quantities).

(Imports and exports in millions of metric tons.)

—	1929	1930	1931	1932	1933
Germany	121 548	114 056	92 777	74 403	77 224
	100	94	76	61	64
France	99 368	97 602	88 433	71 045	73 570
	100	98	89	71	74
Italy	32 263	29 757	25 426	21 344	22 421
	100	92	79	66	69
Austria	14 381	11 786	10 534	7 965	7 786
	100	82	73	55	54
Switzerland	9 757	9 472	9 804	9 192	8 812
	100	97	100	94	90
Belgium	70 914	65 995	63 339	50 934	50 522
	100	93	89	72	71
Netherlands	47 291	48 001	46 719	38 583	36 849
	100	102	99	82	78
Denmark	13 229	13 407	13 549	11 943	11 782
	100	101	102	90	89
Sweden	32 800	29 255	22 206	18 370	21 104
	100	89	68	56	64
Norway	11 050	10 936	8 667	9 108	9 613
	100	99	78	82	87
Spain	18 664	15 817	11 502	10 943	10 197
	100	85	62	59	55
Hungary	9 583	7 347	5 333	3 424	3 633
	100	77	56	36	38
Czechoslovakia	23 131	19 360	17 105	12 279	10 781
	100	84	74	53	47
Poland	26 126	22 493	21 634	15 291	15 342
	100	86	83	58	59
Jugoslavia	7 002	6 247	4 456	3 278	3 723
	100	89	64	47	53
Japan	27 387	24 881	23 558	23 688	27 266
	100	91	86	86	100

trade, the value of world trade has continuously declined from 1929 to 1934. On a gold standard, the foreign trade of the European countries has fallen off by 64 % during this period, and that of the other countries by 68 %; the value of world trade has declined by 66 %.

The evolution of *foreign trade* in the different countries, both in quantity and value, is shown in tables 1 and 2. In the case of nearly every State considered, foreign trade, shown in the currency of the country in question, has shown a more or less uniform decline up to 1932. Against this, after 1932, above all since 1933, the evolution has changed direc-

TABLE 2.

Foreign trade (value).

(Imports and exports in millions of the currency of the respective countries.)

—	1929	1930	1931	1932	1933	1934
Germany	26 111	21 721	15 934	10 344	9 074	8 611
	100	83	61	40	35	33
France	108 360	95 352	72 636	49 512	46 860	40 884
	100	88	67	46	43	38
Italy	36 904	29 466	21 853	15 078	13 397	12 892
	100	80	59	41	36	35
Austria	5 451	4 551	3 452	2 148	1 922	2 016
	100	83	63	39	35	37
Switzerland	4 829	4 326	3 600	2 564	2 447	2 279
	100	90	74	53	51	47
Belgium	67 320	57 036	46 812	30 972	28 872	27 744
	100	85	70	46	43	41
Netherlands	4 742	4 137	3 205	2 146	1 935	1 750
	100	87	68	45	41	37
Great Britain	1 840	1 528	1 187	1 017	994	1 081
	100	83	64	55	54	59
Denmark	3 330	3 180	2 669	2 200	2 388	2 457
	100	95	80	66	72	74
Sweden	3 595	3 209	2 550	2 102	2 175	2 594
	100	89	71	58	60	72
Norway	1 806	1 731	1 314	1 244	1 205	1 296
	100	96	73	69	67	72
Spain	6 045	4 747	2 137	1 714	1 505	1 472
	100	78	35	28	25	24
Hungary	2 102	1 735	1 110	663	707	765
	100	82	53	32	34	36
Czechoslovakia	40 427	33 140	24 832	14 786	11 641	13 603
	100	82	61	36	29	34
Poland	5 924	4 679	3 347	1 946	1 787	1 774
	100	79	56	33	30	30
Jugoslavia	15 508	13 751	9 612	5 911	6 258	7 452
	100	89	62	38	40	48
Japan	4 270	2 938	2 324	2 746	3 710	4 378
	100	69	54	64	87	102

tion. Indeed, in the countries where the currency has been devalorized, for example in England, Austria, Hungary, the Scandinavian States and Japan, the value has increased, whereas in the countries that have remained faithful to the gold standard, that is to say in Germany, France, Italy, Poland, Holland, Switzerland and Belgium — where the devaluation only came into force on the 1st April 1935 — the decline has continued, but less rapidly, it is true. This can be explained to a large extent by the fact that the wholesale trade prices, according to the index numbers, continued to fall off in most of the countries on the gold standard, while they showed a tendency to rise in the countries off the gold standard.

Index numbers of wholesale prices.
(1914 = 100).

—	1929	1930	1931	1932	1933	1934
Germany	137	125	111	97	93	98
France	127	113	102	87	81	76
Italy	131	112	93	85	77	75
Austria	130	117	109	112	108	110
Switzerland	141	126	110	96	91	90
Belgium	123	107	90	77	72	68
Netherlands	142	117	97	79	74	78
Great Britain	137	120	104	102	101	104
Denmark	150	130	114	117	125	132
Sweden	140	122	111	109	107	114
Norway	149	137	122	122	122	124
Spain	168	167	169	167	159	164
Hungary	121	96	95	92	76	79
Czechoslovakia	117	104	94	87	84	87
Japan	166	137	116	122	136	134

When considered from the international point of view, the *world prices* show the following enormous set-back since 1929.

Index numbers of world prices (gold index).
(1929 = 100).

Year.	Total index.	Agricultural produce.	Industrial products.	Raw materials.	
				Foodstuffs.	Industrial.
1929	100	100	100	100	100
1930	78	75	84	78	78
1931	56	54	63	56	56
1932	44	42	51	46	43
1933	41	39	49	40	43
1934	39	37	46	37	41

When the evolution of the value of foreign trade in the currency of the different countries is being considered, it is necessary to take into account the fact that, if they are converted to the gold standard — so as to make possible a comparison of the various countries — the values expressed in the national currency, even in countries with depreciated currency, show generally speaking a continual decline in foreign trade. Table 3 brings out this fact.

TABLE 3.

Foreign trade (value).

(Imports and exports in millions of Swiss francs).

—	1929	1930	1931	1932	1933	1934
Germany	32 244	26 730	19 413	12 653	11 125	10 465
	100	83	60	39	34	32
France	22 008	19 309	14 672	10 021	9 499	8 295
	100	88	67	46	43	38
Italy	10 016	7 962	5 857	3 979	3 608	3 410
	100	79	58	40	36	34
Austria	3 974	3 310	2 089	1 299	1 105	1 147
	100	83	52	33	28	29
Switzerland	4 829	4 326	3 600	2 564	2 447	2 279
	100	90	74	53	51	47
Belgium	9 717	8 211	6 718	4 440	4 160	3 990
	100	84	69	46	43	41
Netherlands	9 877	8 585	6 643	4 455	4 028	3 642
	100	87	67	45	41	37
Great Britain	46 361	38 324	27 718	18 348	17 031	16 816
	100	83	60	40	37	36
Denmark	4 608	4 391	3 452	2 227	1 841	1 705
	100	95	75	48	40	37
Sweden	4 993	4 446	3 314	1 993	1 938	2 079
	100	89	66	40	39	42
Norway	2 499	2 389	1 698	1 149	1 044	1 012
	100	96	68	46	42	40
Spain	4 601	2 847	1 046	710	649	618
	100	62	23	15	14	13
Hungary	1 902	1 565	1 002	460	478	480
	100	82	53	24	25	25
Czechoslovakia	6 206	5 067	3 787	2 253	1 785	1 782
	100	82	61	36	29	29
Poland	3 444	2 705	1 928	1 122	1 033	1 030
	100	78	56	32	30	30
Jugoslavia	1 416	1 255	873	489	434	520
	100	89	62	34	31	37
Japan	10 203	7 481	5 851	3 934	3 846	4 020
	100	73	57	38	38	39

II. — The railways during the economic crisis.

The effects of the economic crisis and of road motor competition have resulted in heavy losses for the railways; to appreciate their extent, it is only necessary to look at the tables given hereafter showing the evolution of the passenger and goods traffic.

Passenger traffic.

Evolution of the passenger traffic.

(See table 4.)

As is known by experience, passenger traffic is less affected by economic fluc-

TABLE 4.

Evolution of passenger traffic.

(In millions of passenger-kilometres).

—	1929	1930	1931	1932	1933	1934
Deutsche Reichsbahn . . .	47 088 100.0	43 298 92.0	36 922 78.4	30 811 65.4	30 117 64.0	34 831 74.0
French Main-Line Railways . .	28 085 100.0	29 124 103.7	28 868 102.8	25 546 91.0	24 583 87.5	... ...
Italian State Railways . . .	6 662 100.0	7 449 111.8	6 373 95.7	6 051 90.8	6 662 100.0	... ...
Austrian Federal Railways . .	3 772 100.0	3 507 93.0	3 183 84.4	2 557 67.8	2 310 61.2	... ...
Swiss Federal Railways . . .	2 937 100.0	3 029 103.1	2 938 100.0	2 776 94.5	2 860 97.4	2 840 96.7
Belgian National Railways Co.	6 365 100.0	6 446 101.3	5 810 91.3	5.157 81.0	5 058 79.5	4 820 75.7
Netherlands Railways	3 669 100.0	3 735 101.8	3 516 95.8	3 085 84.1	3 156 86.0	... ...
British Main-Line Railways . .	31 411 100.0	30 773 98.0	29 041 92.5	28 345 90.2	28 901 92.0	... ...
Danish State Railways . . .	1 061 100.0	1 108 104.4	1 159 109.2	1 158 109.1	1 058 99.7	1 186 111.8
Swedish State Railways . . .	1 405 100.0	1 534 109.2	1 467 104.4	1 457 103.7	1 496 106.5	1 700 121.0
Norwegian State Railways . .	493 100.0	511 103.6	524 106.3	510 103.4	522 105.9	510 103.4
Spanish Main-Line Railways .	3 425 100.0	3 390 99.0	3 119 91.1	3 116 91.0	3 141 91.7	... ...
Hungarian State Railways . .	2 608 100.0	2 578 98.8	2 226 85.4	1 784 68.4	1 756 67.3	... ...
Czechoslovak State Railways .	9 020 100.0	8 664 96.0	7 690 85.2	6 958 77.1	6 368 70.6	... ...
Polish State Railways	7 233 100.0	6 871 95.0	5 604 77.5	4 712 65.1	5 923 81.9	... ...
Jugoslav State Railways . . .	2 245 100.0	2 230 99.3	2 113 94.1	1 765 78.6	1 697 75.6	1 633 72.7
Japanese Government Railways.	21 606 100.0	20 392 94.4	19 043 88.1	18 845 87.2	20 470 94.7	... ...

tuations than goods traffic; for this reason the crisis did not affect it immediately. Only a few railways reported a serious decline in this traffic from the beginning of the crisis. Others, on the contrary, reported, up to 1930 and sometimes even later, a slight improvement, which lasted until 1931 when the passenger traffic began falling off seriously. From that time the depression became general.

In 1933 and 1934 another change occurred in this position, in the sense that the set-back in passenger traffic continued on the same scale on some railways only, whereas on most of the other Systems, it remained more or less stationary, and on a few railways an appreciable recovery was even noticed.

Foremost amongst the railways with the greatest falling off in traffic between 1929 and 1934 (or 1933 for some of them) are the Deutsche Reichsbahn, the Austrian Federal Railways, and the Hungarian State Railways, i. e. the railways of those States whose economic system was the most upset as a result of the great war, the alterations to frontiers, inflation and decline in purchasing power of their currency. If, on the other hand, the passenger traffic of the Danish, Swedish and Norwegian railways remained at a more or less satisfactory level throughout the crisis period, this was partly due to the fact that these railways had already suffered a decline during the years previous to the actual crisis.

All the railways report that, since 1929, passengers more and more abandon the higher classes for the third class, which is explained by the effects of the crisis and the growing competition of motor buses.

Percentages of passengers travelling in the three classes.

—	1929.			1933.		
	1st class.	2nd class.	3rd class.	1st class.	2nd class.	3rd class.
Deutsche Reichsbahn	0.03	7.08	92.89	0.01	4.41	95.58
French Main-Line Railways . .	2.78	13.33	83.89	2.28	14.53	83.19
Italian State Railways . . .	2.16	10.69	87.15	1.45	9.29	89.26
Austrian Federal Railways . .	0.13	1.88	97.99	0.06	1.04	98.90
Swiss Federal Railways . . .	0.28	4.79	94.93	0.10	3.99	95.91
Belgian National Railways Co.	0.53	8.25	91.22	0.30	7.52	92.18
Netherlands Railways	2.50	15.63	81.87	1.84	11.89	86.27
British Main-Line Railways . .	5.19	2.20	92.61	4.00	1.86	94.14
Danish State Railways	—	5.30	94.70	—	2.86	97.14
Swedish State Railways . . .	0.07	2.55	97.38	0.04	1.82	98.14
Norwegian State Railways . .	0.03	0.91	99.06	0.02	0.74	99.24
Spanish Main-Line Railways .	4.68	7.91	87.41	3.18	6.26	90.56
Hungarian State Railways . .	0.28	13.77	85.95	0.05	10.16	89.79
Czechoslovak State Railways .	0.02	1.44	98.54	0.01	0.86	99.13
Jugoslav State Railways . . .	0.10	2.78	97.12	0.03	1.98	97.99
Japanese Government Railways.	0.01	1.45	98.54	0.01	0.83	99.16
Polish State Railways	0.07	5.57	94.36	0.03	5.19	94.78

Passenger receipts.

(See table 5.)

From 1929 to 1933, the passenger receipts have greatly decreased, especially in the case of the Reichsbahn, the Austrian Federal Railways, the Italian State Railways, the Netherlands Railways and the Hungarian and Polish State Railways; the results for 1934 as far as they are known show an appreciable increase in the receipts of some railways, such as the Reichsbahn and the Danish and Swedish State Railways. The increase reported last year on the French main-line railways is due entirely to the reduction of the transport tax, which has given the companies a corresponding increase in receipts. In the case of other railways, the receipts continued

TABLE 5.

Passenger receipts.

(In millions of the currency of the respective countries.)

—	1929	1930	1931	1932	1933	1934
Deutsche Reichsbahn . . .	1 375.24	1 301.45	1 115.16	873.34	821.85	890.89
	100.0	94.6	81.1	63.5	59.8	64.8
French Main-Line Railways . .	3 170.86	3 261.03	3 169.91	2 671.25	2 610.34	2 806.12
	100.0	102.8	100.0	84.2	82.3	88.5
Italian State Railways . . .	1 536.87	1 463.33	1 275.00	1 135.82	1 095.19	1 028.38
	100.0	95.2	83.0	73.9	71.3	66.9
Austrian Federal Railways . .	216.56	215.05	188.30	165.95	148.98	136.47
	100.0	99.3	87.0	76.6	68.8	63.0
Swiss Federal Railways . . .	156.24	159.12	150.72	136.76	135.21	133.21
	100.0	101.8	96.5	87.5	86.5	85.2
Belgian National Railways Co.	841.74	950.15	843.97	729.51	734.03	695.86
	100.0	112.9	100.3	86.7	87.2	82.7
Netherlands Railways	84.10	85.33	79.29	68.51	60.50	54.75
	100.0	101.5	94.3	81.5	71.9	65.1
British Main-Line Railways . .	60.02	57.00	52.39	49.18	49.40	50.59
	100.0	95.0	87.3	81.9	82.3	84.3
Danish State Railways . . .	49.90	49.37	49.86	47.84	40.74	45.71
	100.0	98.9	99.9	95.9	81.6	91.6
Swedish State Railways . . .	63.84	68.47	64.13	59.51	58.58	64.50
	100.0	107.3	100.5	93.2	91.8	101.0
Norwegian State Railways . .	29.09	29.43	29.08	24.56	25.05	25.55
	100.0	101.2	100.0	84.4	86.1	87.8
Spanish Main-Line Railways .	189.27	186.97	165.51	161.81	163.33	162.19
	100.0	98.8	87.4	85.5	86.3	85.7
Hungarian State Railways . .	96.50	93.85	84.44	70.98	66.42	63.83
	100.0	97.2	87.5	73.6	68.8	66.1
Czechoslovak State Railways .	1 106.41	1 085.32	1 049.93	890.36	810.20	775.36
	100.0	98.1	94.9	80.5	73.2	70.1
Polish State Railways	390.22	358.75	305.48	244.16	211.77	..
	100.0	91.9	78.3	62.6	54.3	...
Jugoslav State Railways . . .	705.84	714.69	661.87	544.49	514.10	449.71
	100.0	101.2	93.8	77.1	72.8	70.8
Japanese Government Railways.	256.31	237.52	216.86	210.52	227.42	...
	100.0	92.7	84.6	82.1	88.7	...

to fall off during 1934, but less markedly; this is especially the case on the Austrian Federal Railways, the Netherlands Railways, the Belgian National Railways Company, and the Italian State Railways. It is particularly interesting to note that on most of the railways included in our list the receipts have declined much more than the traffic. This can be explained above all by the reductions in the rates granted during the crisis years, by the movement mentioned above from the higher to the lower classes, and by growing road motor competition.

Goods traffic.

Evolution of the goods traffic.

(See table 6.)

Goods traffic is particularly sensitive to fluctuations in the economic situation,

TABLE 6.

Evolution of goods traffic.

(Commercial traffic, excluding service consignments, in millions of tonnes-kilometres.)

—	1929	1930	1931	1932	1933	1934
Deutsche Reichsbahn . . .	68 936	54 670	45 498	38 905	41 670	50 172
	100.0	79.3	66.0	56.4	60.4	72.8
French Main-Line Railways . .	44 408	43 135	39 352	33 869	32 952	...
	100.0	97.1	88.6	76.3	74.2	...
Italian State Railways . . .	11 994	11 734	10 209	8 989	8 323	...
	100.0	97.8	85.1	74.9	69.4	...
Austrian Federal Railways . .	4 545	3 869	3 199	2 620	2 589	...
	100.0	85.1	70.4	57.6	57.0	...
Swiss Federal Railways . . .	2 189	2 042	1 878	1 544	1 551	1 666
	100.0	93.3	85.8	70.5	70.8	76.1
Belgian National Railways Co.	9 560	8 125	6 895	5 230	4 566	4 598
	100.0	85.0	72.1	54.7	47.8	48.1
British Main-Line Railways . .	28 301	26 620	24 356	22 262	22 467	...
	100.0	94.1	86.1	78.7	79.4	...
Danish State Railways . . .	593	644	620	578	479	510
	100.0	108.6	104.6	97.5	80.8	86.0
Swedish State Railways . . .	2 959	2 828	2 381	1 583	1 577	2 005
	100.0	95.6	80.5	53.5	53.3	67.8
Norwegian State Railways . .	649	715	554	443	447	444
	100.0	110.2	85.4	68.2	68.9	68.4
Spanish Main-Line Railways .	4 703	4 637	4 384	4 250	4 104	...
	100.0	98.6	93.2	90.4	87.3	...
Hungarian State Railways . .	2 684	2 672	2 249	1 925	1 732	...
	100.0	99.6	83.8	71.7	64.5	...
Czechoslovak State Railways .	11 250	9 320	8 281	6 434	5 813	...
	100.0	82.8	73.6	57.2	51.7	...
Polish State Railways	21 129	18 359	18 340	13 343	13 946	...
	100.0	86.9	86.8	63.1	66.0	...
Jugoslav State Railways . . .	3 564	3 042	2 685	2 203	2 387	2 476
	100.0	85.4	75.3	61.8	67.0	69.5
Japanese Government Railways.	12 581	11 282	10 500	10 541	11 611	...
	100.0	89.7	83.4	83.8	92.3	...

Quantitative evolution of foreign trade and goods traffic between 1929 and 1933.

(Coefficient of 1929 = 100)

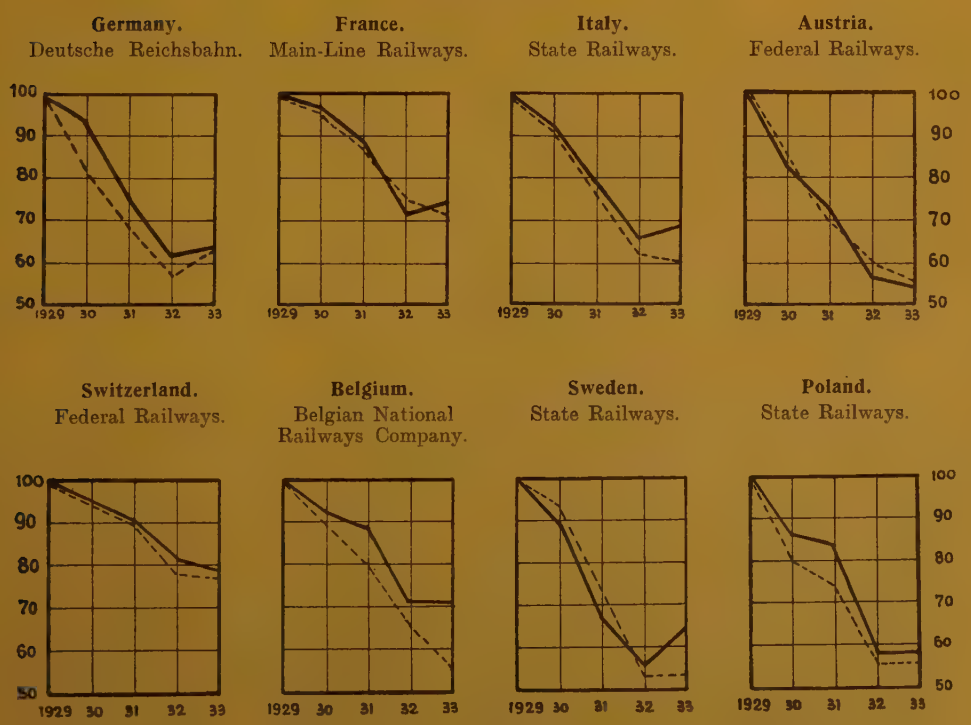
—	1929	1930	1931	1932	1933
Germany.					
Foreign trade	100	94	76	61	64
Goods traffic on the Deutsche Reichsbahn	100	82	67	58	63
France.					
Foreign trade	100	98	89	71	74
Goods traffic on main-line Railways	100	98	88	74	72
Italy.					
Foreign trade	100	92	79	66	69
Goods traffic on the State Railways	100	91	76	63	60
Austria.					
Foreign trade	100	82	73	55	54
Goods traffic on the Federal Railways.	100	84	72	59	56
Switzerland.					
Foreign trade and transit	100	96	92	82	79
Goods traffic on the Federal Railways.	100	96	92	79	77
Belgium.					
Foreign trade	100	93	89	72	71
Goods traffic on the Belgian National Railways Company	100	90	79	64	56
Denmark.					
Foreign trade	100	101	102	90	89
Goods traffic on the State Railways	100	108	100	92	70
Sweden.					
Foreign trade	100	89	68	56	64
Goods traffic on the State Railways	100	93	73	52	52
Norway.					
Foreign trade	100	99	78	82	87
Goods traffic on the State Railways	100	118	83	61	55
Spain.					
Foreign trade	100	85	62	59	55
Goods traffic on the main-line Railways	100	98	90	87	83
Hungary.					
Foreign trade	100	77	56	36	38
Goods traffic on the State Railways	100	95	81	58	46
Czechoslovakia.					
Foreign trade	100	84	74	53	47
Goods traffic on the State Railways	100	88	76	57	51
Poland.					
Foreign trade	100	86	83	58	59
Goods traffic on the State Railways	100	81	74	55	55
Jugoslavia.					
Foreign trade	100	89	64	47	53
Goods traffic on the State Railways	100	86	78	64	63
Japan.					
Foreign trade	100	91	86	86	100
Goods traffic on the Government Railways	100	87	77	78	81

and consequently it suffered from the effects of the general crisis more rapidly and to a much greater extent than the passenger traffic. The decline became manifest from the very beginning of the crisis and lasted until 1932, during the whole of which period it became more and more serious. In 1933 and 1934 this decline came to an end in the case of some railways, such as the English main-line companies, the Austrian Federal Railways, the Swedish and Norwegian State Railways; other railways, in particular the Reichsbahn, the Swiss Federal Railways, and the Japanese Government Railways even reported some recovery in traffic, while on others again, for example the French main-line Railways and the Italian State Railways, the goods traffic continued to fall off.

Experience has proved that there is a close connection between the economic situation and the goods traffic carried by the railways, and likewise between the latter and the state of foreign trade. This is confirmed by the table on page 1116 which clearly brings out the way the goods traffic and the export trade move together.

Quantitative changes in foreign trade and in goods traffic during the years 1929 to 1933.

(1929 = 100).



Goods receipts.

(See table 7.)

The serious decline in traffic naturally led to a large deficit on nearly all the railways. The railways most affected were the Reichsbahn and the Italian, Polish and Czechoslovak State Railways, whose receipts declined by nearly one half between 1929 and 1933. The Belgian National Railways Company, the Austrian Federal Railways and the Hungarian and Swedish State Railways also suffered during this same period from a heavy drop in the goods receipts. The persistent decline in these receipts since 1929 is due primarily to the considerable falling off of traffic due to the gen-

TABLE 7.

Goods receipts.

(In millions of the currency of the respective countries).

—	1929	1930	1931	1932	1933	1934
Deutsche Reichsbahn . . .	3 358.38 100.0	2 737.42 81.5	2 229.02 66.4	1 667.26 49.6	1 749.18 52.1	2 062.28 61.4
French Main-Line Railways . .	11 906.21 100.0	11 753.98 98.7	10 530.95 88.4	9 110.32 76.5	8 515.24 71.5	7 799.96 65.5
Italian State Railways . . .	2 962.69 100.0	2 653.73 89.6	2 159.55 72.9	1 833.41 61.9	1 611.38 54.4	1 503.42 50.7
Austrian Federal Railways . .	431.74 100.0	383.38 88.8	331.66 76.8	273.64 63.4	272.10 63.0	277.81 64.3
Swiss Federal Railways . . .	232.09 100.0	218.61 94.2	210.08 90.5	183.47 79.1	179.12 77.2	178.56 76.9
Belgian National Railways Co.	2 613.80 100.0	2 495.83 95.5	2 169.91 83.0	1 663.16 63.6	1 536.98 58.8	1 464.74 56.0
Netherlands Railways	91.30 100.0	84.74 92.8	79.95 87.6	66.67 73.0	57.97 63.5	49.22 53.9
British Main-Line Railways . .	103.52 100.0	96.51 93.2	87.80 84.8	78.90 76.2	78.53 75.8	83.08 80.2
Danish State Railways . . .	50.79 100.0	53.27 104.9	51.13 100.7	45.76 90.1	36.78 72.4	39.06 76.9
Swedish State Railways . . .	130.89 100.0	119.34 91.2	101.85 77.8	81.57 62.3	82.22 62.8	98.01 74.9
Norwegian State Railways . .	40.68 100.0	39.39 96.8	34.08 83.8	32.00 78.7	31.35 77.1	33.39 82.1
Spanish Main-Line Railways .	557.36 100.0	558.14 100.1	525.35 94.2	522.23 93.7	499.30 89.6	508.29 91.2
Hungarian State Railways . .	193.80 100.0	184.66 95.3	152.71 78.8	133.51 68.9	115.51 59.6	108.35 55.9
Czechoslovak State Railways .	3 833.52 100.0	3 241.00 84.5	2 939.77 76.7	2 309.67 60.2	2 023.10 52.8	2 114.14 55.1
Polish State Railways	1 048.73 100.0	947.85 90.4	834.43 79.6	636.35 60.7	546.53 52.1	... ...
Jugoslav State Railways . . .	1 827.37 100.0	1 824.45 99.8	1 532.14 83.8	1 223.27 66.9	1 261.46 69.0	1 344.72 73.6
Japanese Government Railways.	237.43 100.0	208.60 87.8	185.67 78.2	... ...	205.32 86.5	... ...

eral economic crisis, but for many companies its source can also be traced to the reduction of rates and to the loss of the higher-rated commodities to motor transport. On account of some recovery in the national economic situation, several railways enjoyed an increase of goods transport during 1934. This was the case especially on the Reichsbahn, and the Swedish and Japanese State Railways. On the other hand the receipts of the French main-line Companies, the Italian State Railways, the Netherlands Railways, the Hungarian State Railways, and the Belgian National Railways Company, continued to fall off during 1934.

The following table gives an idea of the extraordinary heavy falling off in traffic receipts during the crisis period from 1929 to 1934. It shows that for most railways the profits from goods traffic which as everyone knows is the chief source of revenue of a railway, declined in a much greater proportion than those from the passenger traffic.

Relative decline in traffic receipts from 1929 to 1934.

—	Passenger receipts.	Goods receipts.	Traffic receipts.
	%	%	%
Deutsche Reichsbahn	— 35.0	— 38.4	— 37.7
French Main-Line Railways	— 11.5	— 34.5	— 29.7
Italian State Railways	— 31.7	— 50.1	— 43.9
Austrian Federal Railways	— 37.0	— 35.7	— 36.2
Swiss Federal Railways	— 14.8	— 23.1	— 20.1
Belgian National Railways Company	— 17.2	— 44.0	— 37.5
Netherlands Railways	— 32.4	— 43.3	— 38.0
British Main-Line Railways	— 15.7	— 19.8	— 17.4
Danish State Railways	— 10.2	— 23.4	— 15.0
Swedish State Railways	+ 1.0	— 25.1	— 14.6
Norwegian State Railways	— 9.7	— 21.7	— 16.8
Spanish Main-Line Railways	— 14.7	— 8.4	— 10.2
Hungarian State Railways	— 33.9	— 44.1	— 40.6
Czechoslovak State Railways	— 30.8	— 44.6	— 41.6
Polish State Railways (1)	— 45.7	— 47.9	— 47.7
Jugoslav State Railways	— 29.2	— 26.4	— 27.2
Japanese Government Railways (1)	— 4.7	— 3.7	— 4.2

Operating receipts.

(See table 8.)

The operating receipts taken as a whole suffered a continuous decline proportional to the falling off in passenger and goods receipts. The most serious decline was on the Deutsche Reichsbahn and the Polish State Railways whose operating receipts by 1933 were barely half those of 1929; next come the Italian State Railways, the Belgian National Railways Company and the Netherlands Railways, whose receipts fell off by one third during the same period. In 1934, several Companies reported an appreciable increase. This is the case in particular on the Reichsbahn and the Swe-

(1) 1929 to 1933 only.

TABLE 8.

Operating receipts.

(In millions of the currency of the respective countries.)

—	1929	1930	1931	1932	1933	1934
Deutsche Reichsbahn . . .	5 353.83	4 570.32	3 848.67	2 934.32	2 920.59	3 326.55
	100.0	85.4	71.9	54.8	54.6	62.1
French Main-Line Railways . .	15 907.71	15 823.43	14 391.97	12 268.82	11 587.68	...
	100.0	99.5	90.5	77.1	72.8	...
Italian State Railways . . .	4 980.70	4 600.07	3 853.47	3 345.88	3 055.85	2 860.28
	100.0	92.4	77.4	67.2	61.4	57.4
Austrian Federal Railways . .	704.72	665.25	550.78	474.69	447.61	440.90
	100.0	94.4	78.2	67.4	63.5	62.6
Swiss Federal Railways . . .	413.82	402.89	386.93	342.95	336.62	333.59
	100.0	97.4	93.5	82.9	81.3	80.6
Belgian National Railways Co.	3 546.69	3 528.54	3 090.73	2 451.98	2 329.92	2 215.75
	100.0	99.5	87.1	69.1	65.7	62.5
Netherlands Railways	180.78	175.51	164.30	139.54	122.44	107.75
	100.0	97.1	90.9	77.2	67.7	59.6
British Main-Line Railways . .	182.78	172.62	158.50	145.34	145.29	151.10
	100.0	94.4	86.7	79.5	79.5	82.7
Danish State Railways . . .	112.62	115.17	114.09	107.08	91.91	100.37
	100.0	102.3	101.3	95.1	81.6	89.1
Swedish State Railways . . .	210.76	201.58	181.23	166.15	166.14	183.75
	100.0	95.6	86.0	78.8	78.8	87.2
Norwegian State Railways . .	77.89	76.67	71.57	64.49	64.29	66.99
	100.0	98.4	91.9	82.8	82.5	86.0
Spanish Main-Line Railways .	780.79	778.22	722.87	713.38	690.11	699.08
	100.0	99.7	92.6	91.4	88.4	89.5
Hungarian State Railways . .	310.60	291.89	251.54	218.88	200.55	188.52
	100.0	94.0	81.0	70.5	64.6	60.7
Czechoslovak State Railways .	5 337.19	5 041.95	4 708.97	3 745.91	3 377.87	3 428.54
	100.0	94.5	88.2	70.2	63.3	64.2
Polish State Railways . . .	1 596.91	1 458.87	1 294.00	1 009.13	888.64	...
	100.0	91.4	81.0	63.2	55.6	...
Jugoslav State Railways . . .	2 647.72	2 655.29	2 382.01	1 975.81	1 907.46	1 930.35
	100.0	100.3	90.0	74.6	72.0	72.9
Japanese Government Railways.	511.20	462.13	418.54	414.10	450.73	...
	100.0	90.4	81.9	81.0	88.2	...

dish, Danish and Japanese State Railways, while other Systems, in particular the Netherlands Railways, the Hungarian and Italian State Railways and the French main-line Railways still report a further decline in their operating receipts.

Operating expenses.

(See table 9.)

Unlike the receipts which began to decline from the very beginning of the crisis, the operating costs first of all continued to increase, or at least only

TABLE 9.

Operating expenses.

(In millions of the currency of the respective countries).

—	1929	1930	1931	1932	1933	1934
Deutsche Reichsbahn . . .	4 493.50	4 090.35	3 622.47	3 001.08	3 056.59	3 301.12
	100.0	91.0	80.6	66.8	68.0	73.5
French Main-Line Railways . .	12 510.60	13 988.59	13 698.90	12 647.81	12 053.61	...
	100.0	111.8	109.5	101.1	96.3	...
Italian State Railways . . .	4 379.83	4 124.73	3 573.49	3 218.47	3 190.14	3 040.20
	100.0	94.2	81.6	73.5	72.8	69.4
Austrian Federal Railways . .	669.49	656.17	589.09	508.80	475.30	460.57
	100.0	98.0	88.0	76.0	71.0	68.8
Swiss Federal Railways . . .	280.38	291.42	283.28	273.30	259.92	247.57
	100.0	103.9	101.0	97.5	92.7	88.3
Belgian National Railways Co.	3 066.82	3 208.36	3 023.94	2 620.48	2 343.26	2 263.59
	100.0	104.6	98.6	85.4	76.4	73.8
Netherlands Railways	130.17	128.82	127.00	117.23	109.46	...
	100.0	99.0	97.6	90.1	84.1	...
British Main-Line Railways . .	143.93	139.48	128.54	121.28	119.36	122.94
	100.0	96.9	89.3	84.3	82.9	85.4
Danish State Railways . . .	109.94	115.55	117.29	112.52	105.12	105.44
	100.0	105.1	106.7	102.3	95.6	95.9
Swedish State Railways . . .	161.50	157.37	156.64	153.29	150.17	155.13
	100.0	97.4	97.0	94.9	93.0	96.0
Norwegian State Railways . .	76.83	78.43	78.41	75.77	71.68	74.40
	100.0	102.1	102.0	98.6	93.3	96.8
Spanish Main-Line Railways .	561.93	570.55	555.67	545.20	557.51	...
	100.0	101.5	98.9	97.0	99.2	...
Hungarian State Railways . .	305.11	287.08	277.93	253.90	255.60	259.95
	100.0	94.1	91.1	83.2	83.8	85.2
Czechoslovak State Railways .	4 989.21	5 072.30	4 665.14	4 445.14	4 038.28	3 812.14
	100.0	101.7	93.5	89.1	80.9	76.4
Polish State Railways	1 413.89	1 331.52	1 187.04	936.01	820.71	...
	100.0	94.2	84.0	66.2	58.0	...
Jugoslav State Railways . . .	2 623.20	2 719.59	2 532.68	2 005.32	1 922.24	1 924.16
	100.0	103.7	96.5	76.4	73.3	73.4
Japanese Government Railways.	...	...	261.13	267.50	275.81	...

decreased very slightly. Only after 1930 did the majority of companies reduce their expenditure to an appreciable extent. Most of them succeeded in making further savings during 1933 and 1934, while others, particularly the Reichsbahn, the Swedish State Railways, and the English main-line Companies then began to increase their expenditure.

The following table shows the extent to which the railways succeeded in adapting their expenditure to their very reduced receipts.

Relative decline in operating receipts and expenses from 1929 to 1934.

—	Operating receipts.	Operating expenses.
	%	%
Deutsche Reichsbahn	— 37.9	— 26.5
French Main-Line Railways	— 32.3	— 12.1
Italian State Railways	— 42.1	— 29.1
Austrian Federal Railways	— 37.4	— 31.2
Swiss Federal Railways	— 19.4	— 11.7
Belgian National Railways Company	— 37.6	— 26 2
Netherlands Railways (1)	— 37 8	— 20.0
British Main-Line Railways	— 17.3	— 14.6
Danish State Railways	— 10.8	— 4 1
Swedish State Railways	— 12.8	— 4.0
Norwegian State Railways	— 14.9	— 10.9
Spanish Main-Line Railways (1)	— 11.6	— 0.8
Hungarian State Railways	— 39.3	— 14.8
Czechoslovak State Railways	— 36.3	— 22.3
Polish State Railways (1)	— 44.4	— 42 0
Jugoslav State Railways	— 27.1	— 26.6

(1) 1929 to 1933 only.

When considering these figures, it must be remembered that the way the operating costs are estimated and the expenditure divided up between the capital charges and operating costs varies considerably from one railway to another, and also that certain companies had begun to reduce their expenditure before the period with which we are dealing. In any case, these figures bring out very clearly that during a traffic crisis it is generally speaking impossible to adapt the expenditure to the receipts as and when these fall off. For technical, operating and administrative reasons the possibility of such adaptation is very limited.

Operating surplus.

(See table 10.)

The unfavourable evolution of the receipts and costs since 1929 led to all the railways having a great decline in their actual operating surplus. Several of them even had a deficit. Thus as early as 1930 the operating accounts of the Danish, Norwegian, Czechoslovak and Jugoslav State Railways, and the next year the Hungarian State Railways showed a deficit. Likewise, by 1932 the Reichsbahn, French main-line Companies and Belgian National Railways Company, then in 1933, the Italian and Czechoslovak State Railways, could no longer balance their operating costs by their receipts. In 1934, the operating accounts of the Swiss Federal Railways, the English main-line Companies and the Swedish State Railways showed an excess of receipts greater than that of the previous year, and after having a deficit for two years, the Reichsbahn also showed a slight operating profit once more. In the same year, the Austrian Federal Railways and the Danish and Czechoslovak State Railways had a smaller deficit, while the Italian State Railways, Hungarian State Railways and Belgian National Railways Company, on

TABLE 10.

Excess of receipts over expenses.

(In millions of the currency of the respective countries).

—	1929	1930	1931	1932	1933	1934
Deutsche Reichsbahn . . .	860.33 100.0	479.97 55.8	226.20 26.3	— 66.76 ...	— 136.00 ...	25.43 3.0
French Main-Line Railways . .	3 397.11 100.0	1 834.84 54.0	693.07 20.4	— 378.99 ...	— 465.93 ...	... ...
Italian State Railways . . .	600.87 100.0	475.34 79.1	279.98 46.6	127.41 21.2	— 134.29 ...	— 179.92 ...
Austrian Federal Railways . .	35.23 100.0	9.08 25.8	— 38.31 ...	— 34.11 ...	— 27.69 ...	— 19.67 ...
Swiss Federal Railways . . .	133.44 100.0	111.47 83.5	103.65 77.7	69.65 52.2	76.70 57.5	86.02 64.5
Belgian National Railways Co.	479.87 100.0	320.18 66.7	66.79 13.9	— 168.50 ...	— 13.34 ...	— 47.84 ...
Netherlands Railways	50.61 100.0	46.69 92.3	37.30 73.7	22.31 44.1	12.98 25.6	... ...
British Main-Line Railways . .	38.85 100.0	33.14 85.3	29.96 77.1	24.06 61.9	25.93 66.7	28.16 72.5
Danish State Railways . . .	2.68 100.0	— 0.38 ...	— 3.20 ...	— 5.44 ...	— 13.21 ...	— 5.07 ...
Swedish State Railways . . .	49.26 100.0	44.21 89.7	24.59 49.9	12.86 26.1	15.97 32.4	28.62 58.1
Norwegian State Railways . .	1.06 100.0	— 1.76 ...	— 6.84 ...	— 11.28 ...	— 7.39 ...	— 7.41 ...
Spanish Main-Line Railways .	218.86 100.0	207.67 94.9	167.20 76.4	168.18 76.8	132.60 60.6	... ...
Hungarian State Railways . .	5.49 100.0	4.81 87.6	— 26.39 ...	— 35.02 ...	— 55.05 ...	— 71.43 ...
Czechoslovak State Railways .	347.98 100.0	— 30.35 ...	43.83 12.6	— 699.23 ...	— 660.41 ...	— 383.60 ...
Polish State Railways	183.02 100.0	127.35 69.6	106.96 58.4	73.12 40.0	67.93 37.1	... ...
Jugoslav State Railways . . .	24.52 100.0	— 64.30 ...	— 150.67 ...	— 29.51 ...	— 14.78 ...	6.19 25.2
Japanese Government Railways.	...	...	157.41	146.60	174.92	...

the contrary, further increased their deficits.

Operating ratios.

(See table 11.)

The table giving the operating ratios brings out the fact that the ratio of operating expenses to receipts from the beginning of the present period of economic depression has become steadily worse. To appreciate these ratios it must be remembered that the different Administrations draw up their operating accounts on very different lines.

TABLE 11.

Operating coefficients.

(Ratio of operating expenses to receipts).

—	1929	1930	1931	1932	1933	1934
Deutsche Reichsbahn . . .	83.93	89.50	94.12	102.27	104.66	99.24
French Main-Line Railways . .	78.64	88.40	95.18	103.09	104.02	...
Italian State Railways . . .	87.94	89.66	92.73	96.19	104.39	106.29
Austrian Federal Railways . .	95.00	98.64	106.96	107.19	106.18	104.46
Swiss Federal Railways . . .	67.76	72.33	73.21	79.69	77.22	74.22
Belgian National Railways Co.	86.46	90.93	97.84	106.87	100.57	102.16
Netherlands Railways	72.00	73.40	77.30	84.02	89.40	...
British Main-Line Railways . .	78.74	80.80	81.10	83.45	82.15	81.36
Danish State Railways . . .	97.62	100.32	102.80	105.08	114.37	105.05
Swedish State Railways . . .	76.62	78.07	86.43	92.26	90.39	84.42
Norwegian State Railways . .	98.64	102.30	109.55	117.50	111.50	111.06
Spanish Main-Line Railways .	71.97	73.31	76.87	76.42	80.78	...
Hungarian State Railways . .	98.23	98.35	110.49	116.00	127.45	137.89
Czechoslovak State Railways .	93.48	100.60	99.07	118.67	119.55	111.19
Polish State Railways	88.54	91.27	91.73	92.75	92.36	...
Jugoslav State Railways . . .	99.07	102.42	106.33	101.49	100.77	99.68
Japanese Government Railways.	...	...	62.39	64.60	61.19	...

Total receipts and expenses.

Table 12 gives some idea of the financial position of the railways in 1934 (in 1933 for some of them). With the only exception of the Netherlands Railways, who balanced their receipts and expenses thanks to a grant from the Treasury, all the other railways considered here had a deficit for the financial year 1934. In comparison with the amount of the receipts the losses on the French Railways and the Danish State Railways were the biggest, and the smallest were on the Norwegian State Railways and the Deutsche Reichsbahn.

In comparing the total receipts and expenses of the different undertakings, it must be remembered that the total expenditure, particularly in so far as capital costs are concerned, is calculated on very different bases from one Administration to another, and that in some cases the deficits of the preceding years are covered by *grants from the State*. This is the case in particular with the French main-line Companies, the Italian and Norwegian State Railways, and the Netherlands Railways. Comparison of the expenditure is likewise affected by the fact that some administrations have been obliged to incur certain expenditures in the interests of the community, particularly in order to reduce unemployment.

Grants from the State.

Total expenses are defined, especially as regards capital costs, according to principles which differ considerably from one Administration to another, seeing that in the case of several of them the deficits of the previous financial

TABLE 12.

Total receipts and expenditure in 1934.

(In millions of the currency of the respective countries).

—	Total receipts.	Total expenditure.	Excess receipts (+) or expenditure (—).	Total expenditure % of receipts.
Deutsche Reichsbahn	3 326.33	3 488.70	— 162.37	104.88
French Main-Line Railways:				
Alsace-Lorraine	793.68	1 069.49	— 275.81	134.75
Est	1 761.95	2 004.82	— 242.87	113.78
State	1 738.40	2 622.46	— 884.06	150.85
Midi and Paris-Orléans	2 250.03	2 928.47	— 678.44	130.15
P.-L.-M.	3 035.04	3 874.21	— 839.17	127.65
Nord	1 728.78	2 247.30	— 518.52	129.99
Italian State Railways	2 884.64	3 172.38	— 287.74	109.97
Austrian Federal Railways (1).	439.26	542.39	— 103.13	123.48
Swiss Federal Railways	333.59	376.56	— 42.97	112.88
Belgian National Railways Co.	2 215.17	2 397.48	— 182.31	108.23
Netherlands Railways	112.38	112.38	...	100.00
British Main-Line Railways:				
Great Western	24.57	25.92	— 1.35	105.49
London and North Eastern	42.69	42.71	— 0.02	100.05
London Midland and Scottish.	58.18	58.13	+ 0.05	99.91
Southern	19.85	19.83	+ 0.02	99.90
Danish State Railways	100.42	120.33	— 19.91	119.83
Swedish State Railways	166.14	181.17	— 15.03	109.05
Norwegian State Railways	66.32	68.81	— 2.49	103.75

years are made good by grants from the State. We give hereafter a brief outline of the sums spent on railways, these last years, by a few European countries.

In the Netherlands, the State bears the deficits of the Netherlands Railways; in 1934 the grant from the State, for this purpose, amounted to not less than 32 418 164 florins, i. e. *67 475 167 Swiss francs*. From 1931 to 1934 the State paid in this way the equivalent of 168.5 millions of Swiss francs. For the 1914-1934 period the sum total of the deficits taken over by the State amounted to 387 061 665 Swiss francs.

In Sweden, the State Railways are not an independent undertaking. They are managed as one of the services of the Public Administration. The State also bears the interests on railway loans if the receipts are insufficient. During the 3 years, 1931 to 1933, the railways were able to meet only half of the interest charges.

In Norway, grants from the State totalled 172 million crowns for the financial years 1915-16 to 1933-34.

In Denmark, the nationalised railways are also worked on behalf of the State, with the result that deficits are to be made good by the Treasury. The State met the capital expenditure and supplied the working capital. Up to 1925, the State Railways had no charges to bear as regards interests; as from 1926, how-

(1) 1933.

ever, they are debited with the amount of the interests paid, but the capital expenditure for which they are paying interest has been reduced appreciably, in view of road motor competition and its effect on the earning capacity of the railway system. In connection with the financial years 1914-15 to 1924-25, the State not only bore all charges as regards interests on the capital invested, but also made good operating losses to the amount of 147.7 million crowns. From 1925-26 to 1933-34, grants from the State totalled 270.6 million crowns.

In Austria, State subsidies represent for the 1924-1934 period, a round sum of 1 400 million schellings, including the transport tax which was credited back to the Federal Railways. For the years 1930 to 1934, falling within the period of depression, grants amount on the aggregate to 718.9 million schellings.

In France, the State has ever made big sacrifices in order to foster the construction of railways and their development. During the crisis years, the State has borne the working losses. Ignoring considerable subsidies for new lines or equipment, the annuities of which it is burdened with, the State has made good for the years 1930-1934, by means of public loans, working deficits amounting to 15 160 millions of French francs, only 2 176 millions of which may be taken as real advances. During the 14-year period 1921 to 1934, the State effectively spent 5 497 millions of French francs on its railways.

The Italian State Railways only have to meet a small part of the capital charges. Despite this, they were not able to balance their accounts for the years 1931 to 1934. On the contrary, their losses amounted to 2 053 million lire, which were made good by the State.

During and since the war, *the Swiss Federal Railways* have had to bear exceptional obligations and charges which they estimate at 500 millions of Swiss francs. Of this amount, the Confederation only refunded 25 millions in 1925. A federal subsidy of 60 million francs was furthermore granted to the Swiss Federal Railways for the additional expenses they went into in order to speed up the electrification at a time when such work was particularly costly.

Evolution of passenger train journeys.

(See table 13.)

In spite of the falling off in the traffic, the mileage of the passenger trains at first still continued to increase generally speaking. Only in 1931 and 1932 did some companies begin to reduce it. These last two years, on the contrary, almost all the railways, improved their timetables, which in most cases meant increased train mileages, sometimes above the 1929 figures.

TABLE 13.

Evolution of the passenger train-kilometres run.

(Millions of train-kilometres.)

—	1929	1930	1931	1932	1933	1934
Deutsche Reichsbahn . . .	417.38 100.0	423.13 101.4	421.33 100.9	416.99 99 9	423 18 101.4	448.43 107.4
French Main-Line Railways . .	267.62 100.0	275.09 102.8	279.27 104.4	271.60 101.5	272.34 101.8	... ...

TABLE 13. (*Continued.*)

—	1929	1930	1931	1932	1933	1934
Italian State Railways . . .	86.70 100.0	91 84 105.9	90.02 103.8	91.95 106.1	100.64 116 1	105.87 122.1
Austrian Federal Railways ..	33.75 100.0	34.69 102.8	33.76 100.0	31.90 94.5	32.01 94 8	... ...
Swiss Federal Railways . . .	26.95 100.0	28.06 104.1	28.59 106.1	28.69 106.5	28 93 107.3	29.44 109.2
Belgian National Railways Co.	42.39 100.0	44.81 105.7	44.20 104.3	44.66 105.4	49.86 117.6	54.70 129.0
Netherlands Railways	38 71 100 0	39.52 102.1	40.32 104.2	40.57 104.8	40 30 104 1	... ...
British Main-Line Railways . .	401.62 100.0	403.77 100.5	397.78 99.0	398.41 99.2	407.88 101.6	420.93 104.8
Danish State Railways . . .	17.85 100.0	19.40 108.7	17.85 100.0	18.08 101.3	17.69 99.1	17.75 99.4
Swedish State Railways . . .	20.21 100.0	21.83 108.0	22.52 111.4	23.31 115.3	25.00 123.7	27.64 136.8
Norwegian State Railways . .	9.22 100.0	10.11 109.6	10.98 119.1	11.54 125.2	11.71 127.0	... ...
Spanish Main-Line Railways .	35.96 100.0	38.74 107.7	35.56 98.9	33.76 93.9	34.46 95.8	... ...
Hungarian State Railways . .	29.02 100.0	31.10 107.2	30.41 104.8	27.87 96.0	30.01 103.4	... ...
Czechoslovak State Railways .	70.75 100.0	73.95 104.5	75.79 107.1	79.21 112.0	83.56 118.1	... ...
Polish State Railways . . .	66.28 100.0	68.42 103.2	68.39 103.2	61.99 93.5	67.19 101.4	... ...
Jugoslav State Railways . . .	20.60 100.0	21.75 105.6	22.64 109.9	22.81 110.7	23.51 114.1	24.45 118.7
Japanese Government Railways.	118.07 100.0	... ...	133.07 112.7	137.94 116.8	144.72 122.6	... ...

Evolution of goods train mileages.

(See table 14.)

They heavy decline in traffic which occurred from the beginning of the crisis has led on all the railways to a gradual and very considerable reduction in the mileage of goods trains. Whereas in the case of the passenger services the figures for 1933 exceed in nearly every case those before the crisis, in the goods services they are almost all still much below those of 1929.

TABLE 14.

Evolution of goods train-kilometres run.

(Millions of train-kilometres.)

—	1929	1930	1931	1932	1933	1934
Deutsche Reichsbahn . . .	259.78	237.01	212.90	190.57	194.60	216.73
	100.0	91.2	82.0	73.4	74.9	83.4
French Main-Line Railways . .	177.98	178.35	158.29	140.65	136.14	...
	100.0	100.2	88.9	79.0	76.5	...
Italian State Railways . . .	58.51	53.81	42.47	41.79	45.28	49.99
	100.0	92.0	72.6	71.4	77.4	85.4
Austrian Federal Railways . .	21.97	20.46	18.88	15.31	15.17	...
	100.0	93.1	85.9	69.7	69.0	...
Swiss Federal Railways . . .	12.46	12.56	11.99	11.32	11.08	11.03
	100.0	100.8	96.2	90.9	88.9	88.5
Belgian National Railways Co.	31.89	28.81	25.29	20.24	19.42	19.54
	100.0	90.3	79.3	63.5	60.9	61.3
Netherlands Railways	15.56	15.45	14.60	13.77	13.55	...
	100.0	99.3	93.8	88.5	87.1	...
British Main-Line Railways . .	224.64	217.25	204.08	192.44	191.86	202.22
	100.0	96.7	90.8	85.7	85.4	90.0
Danish State Railways . . .	3.97	4.39	6.58	6.45	5.87	5.66
	100.0	110.6	165.7	162.5	147.8	142.6
Swedish State Railways . . .	11.24	11.21	11.09	10.30	10.61	11.97
	100.0	99.7	98.7	91.6	94.4	106.5
Norwegian State Railways . .	4.67	4.50	4.36	4.00	4.05	...
	100.0	96.4	93.4	85.6	86.7	...
Spanish Main-Line Railways .	39.16	39.08	35.83	35.82	34.72	...
	100.0	99.8	91.5	91.5	88.7	...
Hungarian State Railways . .	10.04	10.20	9.02	8.10	7.69	...
	100.0	101.6	89.8	80.7	76.6	...
Czechoslovak State Railways .	46.54	43.45	39.01	34.16	31.48	...
	100.0	93.4	83.8	73.4	67.6	...
Polish State Railways	61.22	50.89	48.14	32.96	35.19	...
	100.0	83.1	78.6	53.8	57.5	...
Jugoslav State Railways . . .	26.60	25.52	24.46	22.03	20.45	20.39
	100.0	95.9	92.0	82.8	76.9	76.6
Japanese Government Railways.	58.20	...	50.61	51.68	55.66	...
	100.0	...	87.0	88.8	95.6	...

CHAPTER II.

THE RAILWAYS AND COMPETITION FROM MOTOR LORRIES.

I. — The extension of motor transport as a cause of the traffic crisis.

In our first report, published last year, we described in detail the effect of the competition from motor lorries upon the railways, and we indicated the measures taken by the latter to adapt themselves to the new conditions. The report in question was drawn up by the middle of 1934. Consequently we were able to mention the most recent alterations caused by the extraordinary growth in the number or road motor vehicles. As only a very short period

of time has elapsed since then, the motor transport situation has not undergone any such modifications as would oblige us to deal once more with the problem as a whole. The report would not be any more complete. Consequently, we will content ourselves with indicating the modifications and additions since become necessary.

In the first report, Chapter A, divided into four subsections, dealt with the extension of motor transport as one of the causes of the traffic crisis. The problem was thoroughly investigated therein. Consequently there is no need to return to it. We, however, endeavoured to determine the *increase in the total number of motor vehicles* by collecting for comparison purposes, the figures for the various countries. Tables 15 and

TABLE 15.

Number of motor vehicles in use in the European countries since 1928 (*).

(*Thousands.*)

Year.	Motor cars.	Motor lorries.	Motor cycles.
1928	2 710	990	1 783
1929	3 279	1 137	2 140
1930	3 769	1 303	2 347
1931	3 867	1 363	2 258
1932	3 903	1 390	2 252
1933	4 192	1 502	...
1934	4 560	1 501	...

(*) Not including the U. S. S. R., Turkey, Bulgaria, the Irish Free State.

15*a* give further detailed information in this connection. They show that the increase observed, every year, in the number of motor vehicles for all the countries of Europe has in no way been checked by the economic crisis; at the most it has only been slowed down here and there.

If a comparison is made between the *number of inhabitants of a country and its total number of motor vehicles*, the various countries can be classified in the following order : France, Great Britain, Denmark, Switzerland, Belgium, Sweden, Norway, Netherlands, Germany, Italy, Spain, Czechoslovakia, Austria, and Poland.

II. — Measures taken and suggested in the different fields.

1. Evolution of legislation on concessions for motor transport in the different countries.

Great Britain.

The 1930 Act introduced the obligation to obtain a concession for the *transport of passengers by road.* We described the clauses of this Act in detail in the first report. Its importance lies in the fact that even occasional transports, i. e. those not carried out according to a regular timetable, must obtain a licence. The only exemptions are group

TABLE 15*a*.

Number of motor vehicles in the different countries, 1929-1933.

—		1928	1929	1930	1931	1932	1933	1934	Increase or decrease compared with 1928 %
Germany	Motor cars	351 380	433 205	501 254	522 943	497 275	600 000	674 523	+ 92.0
	— lorries	121 765	143 952	157 432	161 072	152 420	170 000	191 715	+ 57.4
	— cycles	438 283	608 342	731 237	792 075	819 178	...	...	...
France	Motor cars	642 744	930 160	1 109 006	1 251 538	1 280 000	1 387 800	1 432 053	+122.8
	— lorries	306 452	366 007	410 616	437 867	440 000	457 600	458 121	+ 49 5
	— cycles	259 651	405 513	441 503	488 147	480 000	...	...	...
Italy	Motor cars	119 216	188 978	210 669	220 922	236 553	240 593	257 489	+116.0
	— lorries	34 105	52 485	63 993	73 321	81 243	83 243	89 775	+163.2
	— cycles	79 710	80 622	89 146	95 518	100 552	...	...	...
Austria	Motor cars	14 145	19 791	22 903	20 551	25 587	19 775	25 619	+ 81.1
	— lorries	9 672	13 735	16 306	13 372	14 088	14 683	13 746	+ 42.1
	— cycles	28 000	41 781	48 716	32 795	39 423	...	...	...
Switzerland	Motor cars	50 168	55 149	60 735	63 945	65 100	66 394	69 729	+ 39.0
	— lorries	12 049	13 906	14 715	17 195	17 800	18 366	18 847	+ 56.4
	— cycles	38 432	42 306	46 421	46 875	...	31 235	34 085	...
Belgium	Motor cars	57 000	79 884	93 475	111 376	115 000	118 189	121 225	+112.7
	— lorries	43 000	40 444	49 861	63 278	63 500	64 500	68 500	+ 59.3
	— cycles	31 000	39 287	45 814	57 532	61 000	...	...	...
Netherlands	Motor cars	56 118	61 928	71 751	78 833	78 994	87 885	90 550	+ 61.4
	— lorries	27 393	36 500	40 577	45 422	46 012	47 208	47 750	+ 74.3
	— cycles	29 511	32 500	31 316	32 904	33 378	...	...	...
Great Britain and Northern Ireland	Motor cars	980 057	997 923	1 157 344	1 042 530	1 052 125	1 124 410	1 323 850	+ 35.1
	— lorries	305 744	311 410	348 441	340 545	352 493	432 570	401 175	+ 31.2
	— cycles	712 583	715 481	724 319	508 241	468 685	734 123	...	...
Denmark	Motor cars	63 648	70 342	79 704	86 487	84 405	84 830	85 275	+ 34.0
	— lorries	25 250	27 958	30 620	33 851	32 695	33 300	34 273	+ 35.7
	— cycles	21 554	23 107	23 349	24 909	24 083	...	...	...
Sweden	Motor cars	83 292	95 375	101 655	106 501	108 529	105 221	102 393	+ 22.9
	— lorries	26 230	31 523	34 591	38 071	40 626	41 726	38 815	+ 48.0
	— cycles	35 340	49 603	54 846	56 678	55 189	...	...	...
Norway	Motor cars	21 083	23 786	26 189	28 600	30 350	31 316	33 378	+ 58.3
	— lorries	11 678	13 287	15 716	17 878	19 456	20 296	21 114	+ 80.8
	— cycles	6 457	5 946	5 837	5 818	6 317	...	...	...
Spain	Motor cars	129 920	130 000	133 305	125 000	122 730	119 000	130 300	+ 0.3
	— lorries	26 581	35 000	56 345	54 000	52 600	40 200	42 350	+ 59.3
	— cycles	30 000	35 000	37 500	40 000	40 000	...	...	...
Hungary	Motor cars	9 692	13 293	14 215	12 509	11 517	11 500	9 820	+ 1.3
	— lorries	3 405	4 401	4 493	4 304	3 996	4 640	2 528	— 25.8
	— cycles	9 000	10 365	11 041	11 166	10 795	...	...	...
Czechoslovakia	Motor cars	33 075	34 530	43 825	52 129	61 600	69 000	82 985	+150.9
	— lorries	12 328	12 570	19 025	22 511	30 000	30 700	28 933	+134.7
	— cycles	26 830	29 000	32 531	36 314	35 200	...	...	...
Poland	Motor cars	18 316	30 258	31 320	27 086	19 643	20 000	20 649	+ 12.7
	— lorries	3 494	6 738	7 440	6 512	5 623	5 500	5 132	+ 46.9
	— cycles	3 734	5 901	7 940	8 525	8 182	...	...	...
Jugoslavia	Motor cars	8 900	10 250	8 675	10 000	9 667	8 608	8 061	— 9.4
	— lorries	1 580	2 000	2 000	2 800	3 393	2 898	2 884	+ 82.5
	— cycles	3 000	3 000	3 100	3 000	3 000	...	...	...

journeys in vehicles hired for the purpose by a party of private individuals. The Traffic Commissioners to whom the transport rates must be submitted for approval are responsible for granting the licences.

The regulations for the *transport of goods* (Road Traffic Act) came into force on the 1st January, 1934. In our first report, we explained in detail the three classes of licence provided for by this Act. As far as the transport conditions and the rates are concerned, traffic by motor lorry is not regulated in any way by the Act. On the other hand, strict rules are laid down as regards the state of repair of the vehicles, the load to be carried, the maximum speeds, the working hours and rest periods of the drivers. Moreover, for supervision purposes, the transports must be entered in the waybook. The wages of the drivers, like those of the railway staff, are controlled by the State. The application of the law has not yet passed its trial stage, during which efforts are chiefly being made to stabilise the total number of vehicles. But the Traffic Commissioners have already put forward proposals which will very probably limit transport on behalf of a third party by firms working their own private transport.

Ireland.

No changes have occurred since the first report was published.

France.

A decree, of the 19th April, 1934, has imposed a standard form of licence on motor services, both passenger and goods. We have already described in our first report the details of this new law which in many points is like the proposed Swiss legislation. The clauses of the decree tend to allow the railway to recover traffic from professional long-distance road firms. Experience alone will show if this legislation will achieve the desired end.

Spain.

It is intended to introduce new legislation on concessions, to take the place of the law of 1924, which has proved inadequate. But so far it has not been possible to obtain fuller details.

Belgium.

Passenger transport is still regulated by the law of 1932, which obliges both regular services and occasional transport to obtain a concession. If need be, the State can levy a special tax to be made over to the railway.

In the case of goods traffic there is no legislation as yet; the law of the 14th August 1933, imposing a fiscal tax on lorries used for transport from one town to another (tax of 20 % of the transport price for distances over 20 km. = 12.4 miles) could not be enforced and has remained a dead letter. The Minister of Transport laid down a bill of law on the 28th March, 1934, which was given in the September 1934 number of the *Bulletin of the Railway Congress Association.*

Luxemburg.

Motor transport is regulated by the old road traffic regulations, as well as by the law of the 10th June, 1932, on the circulation of motor vehicles.

Motor transport over the public highways, when it is a question of regular services, must obtain a concession, in the case of both passenger and goods services. The operators of motor passenger services, like the railways, have to carry letters and post parcels free of charge.

Netherlands.

Only regular passenger motor services have to obtain a concession. Efforts made by the railways to make it necess-

ary for motor lorry carriers to get a concession have not succeeded up to the present.

Switzerland.

In Switzerland, commercial regular motor *passenger services* are included in the monopoly granted to the Post Office Administration (State mail rights). This kind of transport can only be carried out by private individuals by virtue of a licence granted them by the Post Office (Clauses 1 and 3 of the law on postal traffic, of the 2nd October 1924). Purely occasional traffic need not yet have a licence. Those services are considered as regular services which are carried out periodically, between the same places, within a given time, during certain hours of the day or night, even if no timetables are issued, the proposed times are not kept to, and the rates and timings are not fixed beforehand. There are two classes of concession : in the case of *motor services* operated regularly, « A » concessions are granted in accordance with the decree on motor traffic, of the 8th February 1916, while there are also « B » concessions issued in accordance with the Federal decrees of the 19th March, 1929, and 29th August, 1930, for *regular circular tours* and *ordinary touristic journeys.*

On the 28th September, 1934, the Federal Chambers passed a *law regulating the transport of goods and live stock in motor vehicles* on the public highways (law on the division of traffic). This law was an attempt to regulate competition between rail and road in the case of goods traffic. The proposed law was submitted to the people by referendum on the 5th May and rejected by a large majority. Most of the opponents belonged to two opposed groups. Half of them represented opposition from the Right, amongst which were those who considered the intervention of the State in the road transport industry excessive; the other half represented the opposition from the Left, which considered the restrictions imposed by the law insufficient. The Left could not, moreover, admit that the bill excluded private long-distance transport from the new regulations. As the majority by which the law was rejected favoured contradictory principles, the popular verdict did not give the public authorities any precise guidance for future regulations. Actually one third were in favour of a moderate solution suggested, one third favoured the freedom of goods transport on the road, and the other wanted a goods traffic monopoly. Our first report gave detailed information on the clauses of this law.

As far as the road transport policy is concerned, motor lorry traffic is the subject of the *Federal Law on the circulation of motor vehicles and cycles, of the 15th March, 1932.* This law came into force on the 1st January 1933. It was completed by an order for its application, of the 25th November 1932. This legislation regulates the question of responsiblity in the sense of the causal responsiblity already previously applied to the railways. Apart from this point, the law and decree contain nothing but regulations on policy. The decree on the *working hours and rest periods* of regular motor lorry drivers is also indirectly important for rail and road competition. It was passed by the Federal Council on the 4th December 1933, ratified by the Federal Assembly on the 15th March, 1934, and came into force on the 1st July of the same year. Although this decree does not go as far as the law on working hours affecting other transport firms, and the railways in particular, it very closely approximates thereto. Of particular importance is the fact that the decree *forbids* heavy lorries carrying goods *to run during the night.* This interdiction applies from 11 p.m. to 4 a.m. for the period from the

1st April to the 31st October, and from 10 p.m. to 5 a.m. from the 1st November to the 31st March. A decree passed by the Federal Council on the 29th June, 1934, opens a large number of roads to motor traffic for motor vehicles belonging to private firms, of a width not exceeding 2.40 m. (7 ft. 10 1/2 in.) although, according to the law, only motor vehicles of a width not exceeding 2.20 m. (7 ft. 2 5/8 in.) at the most were to run thereon. Another decree, passed by the Federal Council on the 17th December 1934, authorises the Cantons to allow special vehicles to be attached to heavy lorries and tractors, such as all kinds of machinery used in building, tool-carts, rollers, furniture removal vans, etc. The maximum speed of these road trains is 5 km. (3.1 miles) an hour; outside towns on the open road, on the level, 10 km. (6.2 miles) an hour is allowed.

Italy.

Only motor services regularly operated for the carriage of passengers and goods have to obtain a concession. In the case of goods traffic, however, this law has remained practically ineffective.

Germany.

In our first report, we expressed a hope that the present regulation of motor traffic would be modified very shortly. In the case of goods traffic at any rate, this hope has not been realised. The goods traffic is still regulated by the decree of the 7th October 1931, already described in the said report.

Passenger transport, however, has been regulated again by the « law of the 4th December 1934, on the transport of passengers by road ». This law distinguishes between transport by regular services and occasional transport. In the case of motor services, the old legislation remains unaltered as a whole. Lines from one town to another must obtain a concession. Only regular omnibus services, that is to say worked by motor vehicles with more than 8 seats including the driver's seat, have to obtain a concession, which is only granted if the service in question is needed. It must be refused if the safety and good working of the undertaking is not guaranteed or if the undertaking is opposed to the general traffic interests. As previously, the concession is only granted temporarily. What is new is that the law itself defines that a service is to be considered as regular only when during two consecutive months more than two journeys a week have been worked between two given places. The right to oppose the concession is regulated as previously.

The law exempts the Reichsbahn from obtaining a concession : a very important fact for this Company. Up to the present, this privilege had been granted to the Post Office Administration alone. The process of notification, which up to the present only applied to the Post Office Administration, now applies to the two State transport systems.

The new law also makes it necessary for occasional passenger transport to obtain a licence, whereas previously it was exempt from any such obligation. However, the concession is obligatory not for all occasional transport but for those who carry out special transport in a professional capacity. The latter have to obtain a concession even if they only operate small motor vehicles. In the case of occasional transport, the concession is only granted in case of need. It can be limited to places within a certain radius. As in the case of regular motor services, the special-transport firms are obliged to insure themselves sufficiently to cover satisfactorily claims made, should the case arise, by those carried, or by a third party.

The special regulations in force in *the Sarre* were explained in the first report.

Since the restoration of the Sarre to Germany, the old regime has been done away with, and replaced by the regulations in force over the rest of Germany.

Portugal.

The new law of the 24th January 1934 regulates motor transport. In the case of *passenger services*, this law makes it necessary for both regular and occasional transport services to obtain a concession. The railways benefit by a certain reduction in the tax on feeder lines, and priority of claim in the case of motor competition.

The tariffs (maximum and minimum rates) are fixed when the concession is granted. There are also regulations relating to the timetables, the design of the vehicles, and the drivers. The firms have to insure their passengers against accidents; a financial guarantee is furthermore required from all concession holders.

In the case of *goods traffic*, only regular services have to obtain a concession. These services are classified according to whether they favour the railway or not. Purely competitive lines are not authorised. The granting of the concession can be subject to certain conditions, particularly as regards collaboration with the railway.

In the case of goods traffic worked under a concession, maximum and minimum rates also have been laid down, as well as regulations on the timetables, types of vehicle, and staff.

Private transport is free, and so is occasional traffic. Goods from several consignors, even if handed over to a third party for bulk transport, must be reserved for the regular services.

Passenger and goods motor services are subject to a progressively increasing tax.

Occasional transport over distances of more than 100 km. (62 miles) are subject to a special tax.

Czechoslovakia.

To complete our first report, it should be mentioned that by the law of the 23rd December 1932, the State Railways and Post Office Administration are exempted from applying for a concession. Private railways, on the other hand, have to obtain a concession like other firms. All transporters have to take out an insurance policy to cover themselves against the risk of accidents. Passenger omnibus services pay a tax of as much as 30 % on the price of the tickets.

In the case of goods traffic, vehicles of a capacity of more than 2 1/2 tons are limited to a radius of 30 to 80 km. (18.6 to 50 miles) round the place the vehicle belongs to. Certain classes of goods, foodstuffs, or furniture removals, for example, benefit by special regulations. Purely private transport is not yet regulated, but a new law which is to come into force on the 1st July 1935 discriminates fiscally between transport firms according to the extent to which they are in competition with the State Railways.

Austria.

We have already described in detail, in our first report, the new Austrian legislation, as well as the law of the 9th June, 1934, on goods transport. The fact should be mentioned that, with a few exceptions, private transport is only allowed to operate up to a distance of 100 km. (62 miles). Beyond this distance, private transport is in principle forbidden. As far as we know, Austria is the only country so far to limit industrial transport in this way.

According to the most recent information which we have received, the Austrian Federal Railways and consignors have formed a joint organisation for the collection and distribution services, as a result of which road transport firms are given a larger proportion of the

road traffic than previously. In return, the road hauliers give up transport over distances exceeding 50 km. (31 miles).

Hungary.

In the principal report we have already pointed out the analogy there is between the Hungarian legislation of 1933 and the proposed Swiss law. Let us mention, furthermore, that concessions are only granted up to a maximum distance of 30 km. (18.6 miles) in Hungary. The authority granting the concession, is not the State but the State Railways which, as far as goods traffic is concerned, exercises its prerogative in collaboration with a co-operative society (Mavart). By virtue of the operating scheme drawn up in agreement with the representatives of commerce and industry, the motor lorry is mainly used to work short-distance traffic and to parts at some distance from the railway. The co-operative also deals with the door to door collection and delivery services. It also works some road services intended to replace railway services here and there.

Jugoslavia.

We outlined the law of the 10th May, 1934, in our first report. It will be sufficient to add that private transport firms likewise have to obtain a concession, except for local traffic.

Rumania.

In 1934, motor lorry transport was declared to be a State monopoly and reserved for the nationalised railways in the case of all the important roads. To compensate for this privilege, the railways pay the State a heavy enough contribution. The national railway system is free either to work for itself the road transport reserved for it, or hand it over to other firms.

Poland.

In our first report, we said that there was a question in Poland of extending the concessions law to goods transport likewise. This suggestion, however, has not yet been carried out.

Lithuania, Latvia, Esthonia, Finland, Norway, Denmark, Sweden.

No modifications or additions.

2. Motor transport taxation.

Since our first report was published, nothing has occurred likely to modify the information given in the table in that report. There is a clearly defined tendency towards a fiscal system, a close link between the taxes collected from motor transport and the State allowances towards the construction and maintenance of the roads. It is impossible to ignore the universal tendency to proportion the fiscal charges on motor vehicle traffic to the cost incurred by the State from road traffic. However, as far as we know, no new formulæ have been put forward to fix the contribution to be made by each type of vehicle, according to the amount of wear it causes to the road. In coming years, we shall doubtless see important changes in the taxation systems, the calculation of the taxes, and in their apportionment among the various classes of vehicle. Even in countries which originally only imposed fixed and invariable taxes, it is gradually seen that it is absolutely indispensable to introduce a fiscal system taking into account the amount of work done by each vehicle. On the other hand, the method adopted in England shows that in addition to the taxes proportioned according to the work done by the vehicle, it is also absolutely necessary to impose fixed taxes.

Especially in the economic field is it of the greatest importance to put the railways and roads upon the same footing so that they can fight on equal terms. Thus the railways should untiringly request their governments to correct the

state of affairs due to the unequal way they are treated by law. In particular, a prompt solution should be given to the question of knowing to what proportion, in the different countries, the cost of building and maintaining the roads should be covered by taxes collected from the motor traffic thereon. At the present time, in order to obtain information upon this very controversial question, it is necessary to pursue enquiries among and listen to the affirmations of those chiefly concerned. Consequently it has become urgent for the government to order official statistics to be prepared. To-day, in fact, the figures put forward on the one hand by the railways and on the other by the motor interests are valueless in the opinion of the public on account of their partiality.

In most countries petrol is taxed much more severely than the heavy oil used for the same purposes; motor lorries using heavy oil bear less heavy taxes than petrol vehicles. This is a very unjust state of affairs which should be altered, following British practice. The number of motor lorries fitted with heavy-oil engines is constantly increasing and this method of traction has long since passed the experimental stage. As these are usually the heaviest types of vehicle, the fiscal privilege granted them is of considerable importance.

In Germany, new automobiles and new motor cycles are temporarily free from taxation. Inspired by this example, the motor industry has asked the public authorities of other countries to take similar steps. So far as we know, however, these demands have not been successful.

By granting a special reduction in the price of petrol to foreign motorists, Italy has recently surprised other countries much interested in tourist traffic. It is unnecessary for us to point out the very profound repercussions the granting of such a rebate may have, when it is remembered that we live at the height of international motor tourist traffic.

3. The evolution of legislation regulating railway traffic.

Since we published our first report, nothing has occurred to make us think that we are moving towards a relaxation of the legal obligations imposed upon the railways. In different countries the legislators appear to deal only very cautiously with the indispensable adaptation of the legal position of the railways to the necessities of competition. For the rest, we must ask our readers to refer to our statement regarding this question, in our first report.

4. Steps taken by the railways to increase their ability to compete.

We do not deem it necessary to add anything to the general explanations given in our first report in this connection. On the other hand, we give below a summarised account of the measures taken by the railways : we have taken this information from the annual report published this spring by the International Railway Union. This report, drawn up by the Deutsche Reichsbahn and the Swiss Federal Railways, contains interesting information about the modifications made to the legal provisions dealing with tariffs.

a) *Passenger traffic.*

The British railways extended until the 31st December, 1934, the issue of cheaper tickets known as « summer tickets » which were introduced experimentally for the period from the 1st May to 30 December 1933.

During the 1934 summer season, four surprise (unknown destination) trains were run with great success.

The electrification of railways has

continued. The length of lines with electric traction is now 576 km. (358 miles). New proposals to extend electrification are under investigation.

During the year the number of places whereto « weekly holiday season tickets » can be obtained was considerably increased.

In order to profit by the increasing popularity of hiking, the British railways have introduced special Sunday trains from the large centres. The itinerary of the walks is so arranged that the return journey starts from a different station. In the districts to be crossed walking, the railway provides guides to assist the passengers. The fares are very low and include the services of the guide. These hikes have given good returns, so that it is proposed to continue them.

A certain number of pleasure trips were organised and were a great success. The trains used for these journeys are made up of saloon-type carriages with large windows. The intineraries and timings are arranged so as to run through really beautiful scenery both inland and at the seaside, and to give a stop of one or two hours at the chief places.

During the 1933 summer, a new facility was introduced experimentally, known as « camping coach holidays »; the vehicles used are old railway coaches turned into a caravan with saloon, bed-room, kitchen, etc... These vehicles are put in sidings at various holiday places and by the sea. They are hired out on condition that the renters travel by railway on both the outward and return journeys. As the number of vehicles converted for this purpose proved insufficient it was increased in 1934. The same will be done in 1935.

Last summer tickets were issued which covered, in addition to the railway fares, the hotel or boarding house charges during the trip, as well as the cost of local excursions.

The *Danish State Railways* have purchased, during the year, 10 new diesel-electric railcars (maximum speed 120 km. = 75 miles an hour). These vehicles have 64 seats of one class only; they are used either as express trains, or as accelerated local trains, stopping at intermediate stations.

The fall in the Danish crown having led to a considerable increase in the price of coal, grease and other materials, the long-distance passenger transport rates were increased as from the 1st May, 1934. On the other hand, the supplement for fast trains was reduced by 50 % for journeys not exceeding 50 km. (31 miles).

Finally, at the same time the description of the classes of carriage on the State railways was altered; there are now only two classes: the « common » (the former third) and the « 1st » (the former 2nd). The difference between the fares for the two classes is the same as it used to be between the former 2nd and 3rd classes, that is to say the 1st-class fares are 50 % higher than those of the common class.

The *Deutsche Reichsbahn* has introduced the following new measures during 1934 :

Whereas formerly holiday tickets for the summer or winter seasons were only issued during a given period, as from the 1st May, 1934, holiday tickets are issued during the whole of the year with an initial reduction of 20 % which progressively increases for distances exceeding 400 km. (250 miles).

Since the 1st May, 1934, books of 10 tickets with a reduction of 20 % are issued in the case of services between large towns with more than 100 000 inhabitants, and of suburban services.

In the case of journeys made by

clubs, the following reductions are granted :

33 1/3 % for 12 to 24 passengers,

40 % for a minimum number of 25 passengers,

50 % for a minimum number of 100 passengers.

(Formerly the reduction was 33 1/3 % for 12 to 50 passengers and 40 % for over 51 passengers.)

In addition one free journey is given when 12 to 19 adults have taken tickets (formerly 20 to 29), two for 20 to 39 (formerly 40 to 99), and a third for 40 to 99, and for each group of 50 adults, even when this number is not fully reached, one additional free ticket. This is also granted in the case of student tickets and for groups of young people.

In addition to the reduction of 50 to 60 % granted to passengers in special trains run for the benefit of clubs, a reduction of 75 % (1 Reichspfennig per person per kilometre, third class rate) is granted if the minimum number of tickets from the departure station of the special train to the destination station of the same train is 800.

The reduced luggage rates applying to commercial travellers' samples has been extended to the luggage required by actors and musicians for professional purposes.

The suburban timetables have been improved by putting into service many light trains and railcars. In comparison with 1933, the number of railcar-kilometres has increased by 40 %, and that of the light trains by 16 %.

The commercial (overall) speeds of the long-distance fast trains have been improved by reducing the weight of the trains and shortening the additional time allowed to make up irregularities in the working during the journey.

The number of train-kilometres run daily by trains with an average speed of 95 km. (59 miles) an hour and above increased during 1934 by 386 % in comparison with 1933.

A great many special trains have been put into service at very reduced rates on the occasion of exhibitions, fairs, sporting events, political or economic meetings, holiday journeys organised by the institution called « Kraft durch Freude » (Strength through Gladness) as well as to winter sport centres.

During 1935, ten fast railcar services on the same lines as the *Flying Hamburger* will be introduced, running at an overall speed of 124.7 km. (77 1/2 miles) an hour.

A considerable reduction in the price of the official timetables and the pocket timetables has resulted in much publicity in favour of the use of the Deutsche Reichsbahn trains.

The *French Railways* took the following measures to fight motor competition during 1934 :

General speeding up of passenger trains;

Putting into service of very light trains, with a small number of carriages, the timings of which have been made as fast as possible and the stopping time reduced to the minimum.

Introduction of new connections and improvement of existing connections.

Putting into service railcars, either to work fast services between large towns, or to replace steam trains on certain secondary lines.

The introduction, by means of railcars, of new through services between certain places which previously necessitated a change of trains.

Issuing at certain stations and for given road motor services, combined tickets which include a railway journey coupon and a road journey coupon thanks to which the user can register his luggage from the departure station through to destination.

Modification of the exceptional period of validity of return tickets issued on

the occasion of certain legal holidays. Facility granted to passengers to make a change in their itinerary both on the outward and return journeys.

Modification of the rates for luggage left in the station cloakrooms.

To fight competition from public and private motor vehicles, which is making itself felt to an ever greater extent over short and average distances, the *Italian State Railways* introduced several new measures during 1934, particularly as regard return tickets.

1. Ordinary return tickets (reduction of 20 %), which up to then were only issued for distances of 100 km. (62 miles), are now issued for distances up to 250 km. (155 miles). The validity of these tickets has been extended; it is two days per 50 km. (31 miles) with a minimum of 2 days;

2. Return tickets for fairs and markets (reduction of 50 %) have been included in the tariffs. The object of such tickets is to encourage visits to country fairs. These tickets are only valid for short periods. As a rule they are issued on the market days up till 10 a. m. and are only valid on the day of issue;

3. The conditions under which Sunday, holiday, and week-end return tickets are issued have been extended (reduction of 50 % for individual journeys and 70 % for group journeys of more than 5 people). Previously, these return tickets had only been issued experimentally in a few cases.

Week-end tickets, so far issued as Sunday tickets as an experiment for a limited number of services, in order to encourage traffic to the country, are now issued on all the services for distances up to 250 km. (155 miles) on which Sunday tickets have not already been introduced. They are on sale on Saturday evening and the day before the holidays or on the day itself and are valid the whole of the next working day;

4. Return tickets to sports centres (reduction of 50 %) valid for 15 days, are issued during the winter season from all stations;

5. The rates and transport conditions laid down in the passenger tariff for journeys made by ordinary clubs have also been modified. The minimum number of passengers required in order to profit by the reduction which up to the present had been 15 to 20 people, has been reduced to 8;

6. A permanent reduction (50 %) has been granted to excursions made by families of at least 4 members, including the father and mother, and children under 25 years of age;

7. Weekly season tickets and holiday tickets for workmen and employees are now also issued to students.

The price of season tickets over the whole railway system has been reduced by 10 % and that of identity cards for commercial travellers, entitling them to single tickets at reduced rates has been lowered by 30 %;

8. Moreover, the railway administration has increased the facilities and reductions granted on the occasion of certain special events, by the introduction of return tickets reduced by 50 to 70 %;

9. Finally the luggage rates have been reduced by about 20 %.

The *Lithuanian Railways* have also increased the speed of their trains and improved the timetables to fight motor competition. On certain lines, railcars have been put into service. The rates have been reduced generally; between certain places special reductions are granted for given traffics.

Netherlands. The fares for journeys made by clubs have been reduced, in

particular those for groups of at least 25 persons, when the return journey is made the same day (in this case the members can return separately).

During the summer months, the railways have organised day excursions for students, etc., which include visits to monuments, excursions by water, etc.

In 1933, the passenger rates were reduced by 15 to 20 %.

The legal provisions have been amended; the railways can now modify their rates when there is competition.

The *Austrian Federal Railways* now own 56 railcars, 32 of which have petrol engines, and 24 diesel engines. Among the railcars of most recent design, mention must be made of :

1. The fast light railcars for passenger services, with pneumatic tyres, petrol engines and hydraulic transmission, with a maximum speed of 100 km. (62 miles) an hour;

2. The eight-wheeled railcars for passenger services, with four stroke 8-cylinder diesel engines, without compressors, and with electric transmission, having a maximum speed of 80 km. (50 miles) an hour; these railcars, which have 64 seats, are coupled to light four-wheeled trailers equipped with ordinary buffing and draw gear, each with 62 seats;

3. The four-wheeled rail motor vans, intended to haul light passenger trains on secondary lines, with four-stroke 6-cylinder diesel engines without compressor, with electric transmission, maximum speed 65 km. (40.4 miles) an hour.

As far as tariffs are concerned, in addition to the development of tickets at reduced rates issued on Sundays and weekdays, the following innovations introduced during 1934 should be noted:

1. Weekday afternoon excursion tickets at a reduction of 50 %; these tickets are issued at the Vienna stations for distances of from 1 to 40 km. (0.6 to 25 miles) and are valid after 2 p. m.; the return journey must be made the same day;

2. Sunday and holiday return tickets for combined tram and Federal railways journeys.

These tickets are issued to five different zones at a distance of 1 to 40 km. (0.6 to 25 miles) around Vienna; the total fare includes in addition to the return railway fare a tramway ticket for conveyance from and to the station; the reduction on the ordinary fare is as much as 70 %;

3. Transport facilities for the 1934 summer traffic.

For inhabitants of the country, the reduction was 50 % on the return journey, and for foreigners who had spent a minimum time in Austria, 30 % on the return journey.

With the same object, namely to make the public railway-minded, lotteries have been organised first in the spring of 1933 and again in 1934; the prizes were free tickets in various classes for a railway journey over a given route. Some of the prizes also included free hotel accomodation. This innovation had a very great success among the public.

In agreement with private Austrian railways, the funicular railways, the motor services of the Federal Railways and the Post Office Administration, the inland navigation companies and the Austrian Airways Company, in the 1934 autumn, the Austrian Federal Railways introduced the system of journey stamps. By this means it is possible to buy a ticket by instalments, by purchasing the stamps sold by the Federal Railways.

In addition to the measures taken by the railways of other countries, such as speeding up the trains, increasing the number of services, general reductions in the rates, the *Portuguese Railways*

have also organised popular excursion trains at reduced fares. Moreover, they have also introduced through tickets for combined railway and road motor services.

Swedish State Railways. — The passenger services have been suppressed on the Jämtlands-Sikas-Hammerdal line, a secondary line of little importance, 9 km. (5.6 miles) long, in the province of Norrland. The passengers and luggage are now carried by motor services operated by the Post Office. Through tickets to Hammerdal, issued at all stations, are valid for the road motor bus.

On the Solleftea-Kramfors line (56 km. = 34.8 miles) certain passenger trains have been replaced by motor bus services operated by the railway. Through tickets issued at the railway stations are valid for the motor bus.

The motor bus services from Oevertornea to Pajala (116 km. = 72.1 miles), operated by the railway, which the State introduced in order to avoid building a railway between these two places, must be considered as a line of the State railway system. The cost of the tickets and the goods rates are calculated according to the railway rates.

In order to fight motor competition, return tickets were issued for distances not exceeding 366 km. (227.4 miles); this distance has now been extended to 496 km. (308.2 miles). The return tickets are as a rule valid for two working days before or after the Sunday or a holiday.

Week-end tickets and Sunday tickets have been introduced on many services. There are still special tickets valid every day by given trains to certain destinations, such as excursion centres and watering places. The price of these tickets also includes that of a meal and entrance to the baths.

The minimum number of persons for group journeys at reduced rates has been reduced from 30 to 20, and finally to 10 persons. As a rule the reduction granted is 25 %. In certain special cases, particularly when there is much competition, the departments concerned are allowed to grant reduced rates for the return journey. The minimum fares, however, must not be lower than the single fare.

The Swiss Federal Railways have taken the following measures :

1. Issue of Sunday tickets (week-end tickets) valid for two days between the 6th October, 1934, and the 14th April, 1935; with these tickets the return journey is gratuitous.

2. Organisation of a « youth travel week » during which each holder of a full-rate ticket had the right to take one child under 16 or two children under 10.

3. Organisation of a second « Swiss travel week » during which single tickets were valid for the return journey.

4. Introduction of a light single-phase railcar with a maximum speed of 125 km. (77.7 miles) an hour, which runs 565 km. (351 miles) every day (1935 Summer timetable). A second railcar of the same design is kept in reserve and ran be used for spetial journeys when ordered.

The *Czechoslovak State Railways* introduced, on the 1st January 1934, new rates for passengers, luggage and express parcels.

This tariff grants a general reduction of the fares. The reductions amount to 6 % for short distances and 12 % for longer distances in local trains. On the average the reduction is 9.5 % on a 3rd-class ticket.

The ratio between the fares for the different classes has been altered; the 2nd-class fares are now 1 1/3 of the 3rd-class fares (formerly 1 1/2), the 1st-class fares being double the 3rd-class (formerly 2 1/2).

From the point of view of the rates a new class of train known as *fast* trains has been introduted. Formerly there were only stopping and express trains. The fares for the express trains are based on those for the stopping train tickets plus a supplement which varies according to the distance and the class. The supplement for the *fast* trains is half that for the express trains.

In the case of special trains and group journeys by the regular trains, the minimum rate and the minimum number of passengers have been reduced. Circular tickets have been introduced with a reduction of 20, 30, and 40 % according to the distance travelled.

Hungary. — The lasting economic crisis and motor competition compelled the railway to introduce new tariffs. The travelling public having less money to spend than formerly, the railway was obliged to grant still greater facilities to those travelling on annual or six-monthly season cards. In this connection it was decided to issue quarterly season tickets which could be paid in monthly instalments. These tickets are valid over the whole of the railway system. However, the same benefits are granted for journeys of 400 or of 200 km. (248 or 124 miles). Special weekly season tickets for workmen who are not employed all the week have also been issued, as well as books of coupons for 10 journeys, issued to the unemployed when looking for work. In order to fight competition from bicycles and also to encourage those who usually walk to go by train, the rates for the stopping trains have been reduced by 25 % for distances of 1 to 5 km. (0.6 to 3.1 miles), and by 9 % from 6 to 15 km. (3.7 to 9.3 miles). In the same way the rates for the through trains for journeys of 101 to 170 km. (62.8 to 105.6 miles) have been reduced by 4 %, from 171 to 330 km. (106.3 to 205 miles) by 8 %, and over 330 km. by 10 %.

As the economic situation showed a slight improvement in 1934, there was an increase in traffic, but in spite of this the receipts continued to fall as the travelling public more largely profited from the facilities offered it, and also because since 1929 it has preferred the cheaper classes of travel. As an experiment, a new class of train known as accelerated trains was introduced. The rates for these trains is half way between that of the stopping and that of the through trains. The extra amount is paid as a supplement to the stopping train fares. In order to encourage internal traffic, the railways issued, during the summer holiday season, cheap tickets to the Hungarian lakes. In order to check the change over from 2nd to 3rd class, it was decided to grant a new reduction of 15 % on 2nd class seasons, the price of which was already very low. In addition, the regulations for group journeys were modified and the fares reduced.

b) *Goods traffic.*

The *British Railways* have taken the following new measures :

a) They have themselves organised road services to collect and deliver livestock; at certain places door to door services are worked by motor lorry.

b) They have introduced an insurance system to cover the dealth of or injury to cattle in transit.

In connection with point (*a*), the following point should be noted : Rates officials attached to the railway managements attend the fairs and cattle markets and canvass the markets, offering lower rates than road firms.

c) They have extended the system of rates known as agreed rates, which include an obligation on the part of those benefiting by them to send all their consignments by rail.

d) They will carry consignments

against payment on delivery in both fast and slow goods traffic.

e) They are continuing to extend the container system, as for example for the carriage of furniture.

The *Danish State Railways* have modified the goods rates in the sense that they charge more for returned empties if these were not sent by rail when full.

The *Deutsche Reichsbahn* has speeded up its goods trains by applying generally the maximum speed of 65 km. (40.4 miles) an hour. Some of the speeded up goods trains even run at 75 km. (46.6 miles) an hour, and two of the fast goods trains during the early fruit and vegetable seasons between Bühl and Berlin, and between Bebra and Hamburg, have a maximum speed of as much as 90 km (56 miles). It should also be pointed out that a whole series of goods trains has been introduced, intended to work the traffic regularly even when the volume of traffic is very small. To avoid handling operations on the journey and to shorten stops in the case of the local goods trains and the « Leig » trains, a greater number of motor lorries have been introduced to replace trains, and small locomotives have been used to a much greater extent than formerly, especially for short-distance runs. In the case of secondary lines, the speed has been increased.

The « night services » worked by express goods trains between some of the large cities, to fight motor competition, have given good results. Consequently it is proposed to increase their number. They make it possible to transport goods very quickly, so that when handed in during the evening they can be delivered the next morning, at distances up to 300 km. (186.4 miles) and during the afternoon at distances up to 500 km. (310 miles).

In certain services particularly menaced by motor competition, the parcels traffic has been considerably accelerated by grouping consignments of both fast and slow goods.

Transport by means of containers has been developed so as to give the public to an ever increasing extent, like the motor lorry services, a door to door service without transhipping any part of a consignment. It is appreciated that this door to door service makes a considerable saving in the cost of packing. The railway already owns 11 000 small containers and the number is still being increased. To facilitate loading and unloading these containers, cranes are used, and also recently loading guides fitted on the lorry or motor lorry.

The small containers are being more and more used in international traffic. At the present time, the Netherlands, Belgium, England, Denmark, Sweden and Norway have drawn up the rates and exchange conditions in agreement with Germany, which country is about to sign other such agreements with some more countries.

For a year, railway wagons have been carried to a client's premises by means of a special road vehicle. This service has given excellent results. The special vehicle is in great demand because it has undoubted advantages over the ordinary motor lorries and can be used where sidings are not available.

The *Italian State Railways* have introduced exceptional rates for carrying certain goods to the ports; these exceptional rates are granted by simple agreement with the consignors.

As from the 1st December 1934, especially advantageous rates for certain categories of goods came into force in the different zones.

In order to develop the express parcels service, particularly affected by motor competition, the maximum weight allowed has been increased from 30 to

40 kgr. (66 to 88 lb.), and the number of stations at which such traffic can be handled has also been increased.

The *Lithuanian State Railways* have made agreements with hauliers for the cartage of parcels to the consignee. Certain goods benefit from exceptional rates.

Netherlands. — The most important measure introduced to fight the transport crisis was the issue of completely revised goods tariffs on the 1st May 1933. The new tariffs have greatly modified the calculation of the charges, as well as reduced the cost of transport. At the same time the terminal charges, when not completely suppressed, were greatly decreased. The most important changes are the following :

a) The new tariff, which applies to 3 classes, and no longer to 4, namely, *slow, fast* (including both the former fast and the free delivery service), and *express parcels.*

b) Free delivery of parcels wherever the railways have organised haulage and cartage services.

c) The rates for complete wagon loads of less than 5 tons have been considerably reduced.

d) When several complete wagon loads are sent by a consignor to the same consignee, the rates are lower because the 15-ton rate is applied if the average weight per wagon is 8 tons.

Norway. — Special rates for milk (from the 10th March, 1934).

Special rates for parcels between certain stations.

Special fixed rates for certain classes of goods.

Competitive tariffs for consignments sent as part loads of at least 2 tons for distances up to 200 km. (124 miles) with differential rates up to 300 km. (186 miles).

Reduced rates for the transport of goods to the consignee's premises from the destination station.

Reduced rates for livestock (from the 1st August, 1934).

Through goods services, between the railways and motor services, starting at the railway stations.

The railways have made a whole series of agreements with consignors according to which the latter promise to make use of the railway for their part consignments from and to a railway station over a certain distance. As a rule reduced rates are granted, in addition to special cheap rates for certain routes.

In the case of the *Austrian Federal Railways,* the following measures concerning rates are worthy of note : the benefit of certain rates for raw materials and spares is only granted if the manufactured goods themselves are sent by rail; in the case of the grouped goods sent by consignment firms, the rates have been considerably reduced for the services between the most important centres. Special reductions are granted for all classes of goods within a radius of 110 km (68.3 miles) if the consignor promises to send a given minimum tonnage by rail.

The rates for returned empties have been completely revised. Such a revision had become absolutely necessary, owing to the fact that consignors had made it their practice to send their goods by motor lorry while the empties were sent back by rail, the rates for empties being particularly cheap. Today, according to the new rates, empties are charged the same rate as *new packing materials,* which is much higher than the old rate. Consignors can, however, still benefit from the old rates if they can prove that the empties were sent by rail when full.

The *Portuguese Railways* grant reduced rates on condition that a minimum tonnage is sent by rail.

The *Swedish State Railways* introduced on the 1st January 1934, special rates for small consignments of less than 500 kgr. (1 100 lb.), and a still lower rate for those of over 500 kgr. The rates are so calculated as to compete with road firms whose undertakings are run on strictly commercial lines. For distances of 200 to 300 km. (124 to 186 miles) the rates are very low. After these distances the new rates applicable to parcels weighing less than 500 kgr. (1 100 lb.) come half way between the old and the new rates. If the volume of traffic does not change, the receipts will consequently remain on practically the same level. The new rates applicable to small consignments of more than 500 kgr. are lower than the old ones.

The rates for complete wagon loads for the higher classes of goods have been reduced, as well in the case of loads of 2.5 tons, as for 5 and 10 tons. In the case of valuable goods these reductions are granted as well with the so-called « 2.5 ton » rates, as « the 5 to 10-ton rate » and the « 10-ton », up to 500 km. (310 miles); for lower classes of goods these reductions are only granted over short distances.

The *Swiss Federal Railways* have continued to fight motor competition by means of agreements made with consignors, by reductions on the rates for parcels traffic, and by the application of special rates.

In the case of complete wagon loads, agreements have been made with nearly all the important firms. The reductions granted are on the average some 20 % on the usual rates.

In the case of parcels, reductions have been granted for consignments of 1.5 tons, and recently also for 1 ton, on condition the consignors promise to send a certain minimum tonnage. In the case of short distances, these reductions are about 30 % of the rates applicable to small consignements (packages). On the other hand, the small consignment traffic benefits by a reduction of 5 to 30 % according to the tonnage sent annually by rail.

In order to reduce the cost of cartage charged by private hauliers, the *Czechoslovak Railways* themselves organised lorry services. This method of coercion proved efficacious. The hauliers formed a cooperative on which the railway exerts sufficient action. This cooperative was set up in February 1934 under the name of « Spedra ». It includes at the present time 314 of the most important Czechoslovak haulage firms. On the 1st January, 1935, the cartage charges were generally reduced and the rates standardised. At the same date the « Spedra » groupage services began to function on about 120 routes.

Certain very important special tariffs have been completed without any financial sacrifice on the part of the railway; in fact a special clause has been added to them, specifying that the firms which want to benefit by these rates must only use motor transport for very-short distance services.

Hungary. — In *1934* the system of making special agreements with certain consignors has been developed; by these agreements customers who want to benefit by the reduced rates have to promise to give up road transport over distances exceeding 30 km. (18.6 miles). The coal mines had to undertake to send by rail all the coal they sell, if they wished, to benefit by the special rate for coal.

5. Extension of door to door services in railway traffic.

Collaboration between the railways and haulage and forwarding firms.

We have only to modify one of the points we made in our first report on

the position in the different countries. In *Switzerland* the law dividing up the traffic was rejected by popular vote on the 5th May 1934, so that a special commission appointed by the Administrative Council is investigating whether it is advisable to maintain and develop further, and under what form eventually, the co-called « Asto » services set up as an experiment by the Federal Railways to complete or replace railway transport.

Mention may also be made of the new regime set up in *Austria* where collaboration has been achieved between the State Railways and the haulage firms and forwarding agents, in order to organise door to door services.

6. — Active participation of the European railways in motor transport.

We have nothing to add to our remarks in this connection in the first report, particularly as regards the participation of the railways in motor transport. This participation is continually increasing, under one form or another. The important fact, however, is not the form taken by this branch of railway undertaking, but the growing influence obtained thereby in the road transport industry and the development of collaboration between the railway and motor lorry services. To the list of countries which by modifying their laws have expressly given the railway the right to replace certain trains, and even entire lines, by motor services, *Switzerland* must now be added. In effect an « urgent » decree of the 20th December 1934 gave the Federal Council the power to authorise the Federal Railways to make such modifications in their method of operation as appears (to the Federal Council) useful to adapt the service to the new traffic conditions, and in accordance with the national interests. At the present time an investigation is being made to find out in what cases the Federal Railways would profit by making use of this authorisation. It should, however, be pointed out that radical reforms cannot be expected from this, any more than considerable savings.

[385. 1 & 656]

INTERNATIONAL RAILWAY CONGRESS ASSOCIATION.

INQUIRY INTO QUESTIONS OF IMMEDIATE INTEREST.

(Decision taken by the Permanent Commission at its Meeting held on July 29th, 1933.)

QUESTION II.

" The World Crisis and Railways "

and the effects of the crisis on railway working; measures taken to lessen the effects of the crisis; competition or collaboration between railway and road transport; a forecast of the future; new ideas as to passenger transport, such as light quick trains between large towns and between large and small towns, running at regular intervals ».

SPECIAL REPORT

by Reichsbahndirektor von BECK,

Member of the General Management of the Deutsche Reichsbahn (German State Railway Co.)

I.

The economic crisis and the traffic crisis.

In the reports drawn up on this question (the list of which appears on page 1158 hereafter), it is in the first place pointed out that while nearly all railways throughout the world are feeling the effects of an economic crisis, there exists at the same time a crisis in the transport industry, which is due principally to the extension of road motor traffic and to some extent to navigation being favoured, and to the development of air lines.

No doubt the fact that the two crises exist side by side increases in many respects the severity of the railways' troubles. It would, however, be a mistake to assume that the consequences of the constant increase in road traffic would not affect the railways to an appreciable extent if it did not come in conjunction with the economic crisis. On the contrary, it is rather to be anticipated that not only will every improvement in economic circumstances lead to the development of road traffic at a faster pace than the increase in railway traffic, but that any improvement will stimulate the use of the motor vehicle in competition with the railways. The increase in the number of motor vehicles, favoured by every improvement in the economic situation, would then make still more deplorable the position of the railways at any aggravation of the trade depression.

It is also emphasised in the reports that the present crisis in economic life is partly due to the prevailing circumstances and partly to be attributed to structural alterations in economic conditions. The disturbances under which

international economic relations have been suffering for several years are mainly of a structural nature. In this connection, attention is specially drawn to the industrialisation of overseas countries, resulting from the world war: this process as it continues is gradually and steadily dislodging the European countries from the preferential position which they formerly occupied in world trade as producers of machines and commodities. For this reason they not only are losing marketing opportunities outside Europe with the result that economic exchanges are rendered difficult with those very overseas countries in respect of the raw materials, for which they were for long the best customers, and which, from the point of view of natural conditions, such as geological and climatic factors, were the natural sources of supply for many important raw materials for the whole world, but the industrialisation of the overseas States, in addition, is now having its repercussions on the European markets in the form of competition from those countries which formerly were themselves markets.

The disturbances in world economics, which have in recent years caused so pronounced a drop in world market prices, are doubtless to be attribued to a great extent to these structural displacements. Now, these are influences on economic life which, as regards their influence on traffic also, are to be considered as permanent.

On the other hand, the causes which hinder the international exchange of goods, due to the condition of the currency and capital markets, in part have their origin in the changes mentioned above which, within world economy, are characterised by the transfer of certain functions from one country to another, as is the case with the production of raw materials and the manufacture of goods and machines. Currency depreciations which have taken place in recent years in several European and extra-European countries, partly with the definite object of providing new incentives to the trade, and in particular to the exports of the country in question, are of course no more capable of overcoming the consequences of these structural changes in world economics than is the state of control of currency resorted to by the same or by other countries for the protection of their economic life and in particular for the protection of their own currencies.

The prejudicial effects of such measures upon world trade, by the direct hindering of the international exchange of goods, are on the whole far greater than the stimulation which world trade receives indirectly from the trades of individual nations which, as a rule, are merely temporarily revived by such emergency measures.

World economic interests require that all currencies should, as soon as possible, show a fixed relationship to one another in the same way as in the pre-war period, and that natural economic possibilities of exchange should be restricted as little as possible by State interference.

The railways have a special interest in this, not only because they participate directly and widely in international traffic, but also for the reason that as carriers of internal traffic, dependent as they are upon the economic position, their interests require that the economic structure of their country should find a safe foundation in an undisturbed world economy.

Structural alterations have also occurred, however, within the various countries for other reasons than as a direct result of these changes in world economics. Indirectly, quite appreciable alterations in trade occur, particularly in connection with the moulding of individual national economics for the em-

ployment of their home raw materials. The development of the use of water power, and the consequent revolution in the production of energy, tend in the same direction. Measures of planned economy, to be found particularly in agricultural production in various countries, in some cases imposed by the State itself and practised in others with its permission or encouragement as means for putting agriculture upon its feet, give rise to similar consequences. On the whole it is to be expected that with these structural alterations in the internal economic systems, there will be a reduction in the carriage distances, and in the quantities transported. A revival of trade and traffic, essentially depending on circumstances, could not contradict this fact.

As regards the actual traffic crisis which, as already mentioned, is principally to be attributed to the extension of road motor traffic, conditions as between individual countries and even within the same country differ in many respects for the various railways. The effects of road competition on the financial position of the individual railways, differ greatly in importance. There is a lack of uniformity also in the opportunities offered to the railways to take advantage themselves of the growth of road traffic. It may be said, in general, that the prejudicial effects for the railways increase with the density of the rail and road networks, and are more severe the nearer the range of action of the motor vehicles approximates to the average distance of conveyance of the railway traffic. Railways with a small network in districts with heavy traffic where there are well built roads are, therefore, as a rule the most seriously hit, financially speaking, by the extension of motor traffic. On the other hand, the prejudicial consequences of the extension of motor traffic are, in general, more serious in the larger countries and in their action upon the more widely extended railway systems. At the present time sufficient attention is not yet paid them by economic circles and by Governments.

At present as in the past, the initial inequalities in the conditions of competition with the road motor, which have been artificially created by legislation, play a greater part in the increased competition offered by road vehicles than do the inequalities which result from the different technical characteristics of the two means of transport. Special significance should be given in this connection to the regulations as regards tariffs, imposed on the railway companies. On the one hand, it is certain that rates, which are imposed primarily with a view to furthering the economic interests of the public without paying attention to the actual costs of individual transport and the possibilities of competition, artificially give the motor vehicle a great advantage, as regards rates. On the other hand it is now becoming generally recognised in economic circles also that a sweeping relaxation of this rate system must be accompanied by most severe disruption of the national economic life. For the majority of the railways, moreover, a departure from the rate system used hitherto would show drawbacks from a financial point of view.

The extension of motor traffic, in spite of all State measures and defensive steps taken by the railways themselves, will progressively reduce public traffic in favour of private traffic concerns and will result in present customers of the railways becoming self-sufficient. The railways will therefore, in consequence also of this structural alteration in the very nature of traffic, have to reckon for many years upon a diminishing traffic volume. Their position will be further aggravated because the increased competition for the same amount of traffic will

doubtless bring about an ever more appreciable drop of the rates. It is, therefore, necessary to examine with the greatest caution, any measures for the railways to improve their position, which call for considerable investments of fresh capital. The bases of a policy for contracting loans for railway purposes are very different from what they were before the war.

II.

Economic developments during the last few years and their reactions upon railway traffic.

In our main report, we stated that for all countries and for the majority of railways the financial year 1929-1930 brought about in a fairly uniform way a marked set-back of the economic position and of the traffic. Causes of a purely economic nature are doubtless responsible for this, as well as the structural alterations dealt with in the preceding chapter. Reference may be made here to the numerous tables which are included in the reports. From these tables and in particular from those given in our second report, it may be seen that since 1933 there has been a revival in the internal trade of most countries and also in the traffic of most railways. This is, however, in the main, limited to trade within the various countries, and in many countries is obviously attributable to a great extent to measures taken by the public authorities to deal with the crisis e.g., with regard to public works, and notably the promotion of road making, the granting of reconstruction credits, financial measures to promote consumption of commodities, etc. The depreciation of the currency should also be mentioned here. Above all it is, however, the great increase in expenditure on armaments throughout the world which in recent years has had a strong influence on the developments in internal markets. The momentary success of all the measures mentioned, especially with reference to the reduction of unemployment and the decrease of the dangers which were produced by its constant extension, are undeniable. On the other hand, in spite of the improvement of the economic position, the inertia of private enterprise, which is still to be noted in many cases, gives reason for apprehension.

The development of the railway traffic, which is shown in the said reports by numerous tables, follows approximately the development of economic activities in the various countries. Passenger traffic and in part also high-grade goods traffic, where it is not threatened by increased competition from motor vehicles, have shown themselves in general to be less sensitive to the economic crisis than the remainder of the goods traffic. The quantitative increase in traffic, which set in approximately in 1933, is practically everywhere due mainly to bulk goods traffic and notably to the traffic in such goods, the increased production and sale of which have been especially stimulated by the above mentioned State measures.

The decline in receipts was extremely great on all railways from 1929 to 1933, and even with the improvement in traffic in the last few years, the receipts have by no means improved in proportion to the quantitative traffic increase.

Owing to the typically high fixed charges of the railway traffic, hardly any of the railways was able, when traffic and receipts declined, to cut down the expenditure in like measure. There was to be found everywhere an increase, often very marked, in the operating coefficient. At the present time this coefficient is generally less favourable than it was before 1930.

This also applies to the operating surpluses and the relationship in which the total receipts and total expenditures of

the individual railways stand to one another. In the latter connection, however, it is generally not possible to compare the railways, because in several countries consideralbe State subsidies have been given in recent years to the railways, while in other countries especially State railways have had to go into considerable expenditure in the interests of the community, above all in order to combat unemployment.

III.

Measures for overcoming the transport crisis.

The road-rail problem has not yet been solved in any country. The difficulties which stand in the way arise principally from the fact that, up to the present, in no case has the State taken up a clear attitude as to the fundamental question of the extent to which, taking into consideration the various interests of the State, and the economic requirements, it is to be regarded as permissible or even desirable that, by means of the motor vehicle, private traffic should increase at the expense of public traffic. Only when a clear-cut answer has been found for this fundamental question, and when, in accordance with it, the future direction of the State transport policy has been approximately fixed, will the railways be able to know with sufficient certainty what is to be their future activity. This applies not only to the future expansion of rail traffic and the functions which are to be left to the railways, but also to the possibilities of the railway as a transport undertaking and as an economic entity. Only when these points have been settled will a clear judgment be possible as to what steps the railways will have to take, in their own sphere of responsibility, in order to adapt themselves to the conditions brought about by the advent of the motor vehicle, and thereby to overcome successfully the actual transport crisis in a manner which will not be merely transitory. Legislative or administrative measures which have hitherto been taken for the purpose of solving the road-rail problem are, on the whole, to be regarded merely as experimental. The same applies to the defensive steps the railways have themselves taken.

The following remarks are intended to give, as well as a survey over the present position of affairs, a glimpse of the direction of development as far as can be ascertained at present. Reference will be made at the same time to results obtained up to now from the various measures. In this brief report, we shall not, therefore, go into details concerning the individual countries; for this purpose resort should be made to the main reports.

Legislation.

Railway legislation.

The relaxation of the special legal requirements imposed upon the railways was demanded by the latter in many countries with special emphasis; this appeared, at first sight, easier to put into execution than a more strict motor vehicle legislation. At the same time, it is to be noted that it is in this connection that the position has nowhere been radically altered; above all there has not been relaxed in any country the *obligation to carry*, which principally handicaps public railway traffic as opposed to the private motor. A relaxation of the *obligation* to operate imposed upon the railway is, up to the present, to be found only in relatively few countries and even then only in the sense that the suppression or restriction of railway traffic on lines of relatively little importance and the closing of small stations have been rendered more easy. The compulsory

tariffs and the obligation to publish tariffs still exist unaltered in the case of most railways. In no case have the railways been granted the right to fix their carriage rates as they desire, or even merely for competing with the motor vehicle, or to grant unlimited and non-published rate reductions. Where facilities have been granted at all regarding the liability to publish the tariffs, they only concern in the main the granting of exceptional goods rates. For these, the railways have been freed from compulsory publication in some countries, provided certain conditions are fulfilled and the reduction does not exceed a given maximum. The same purpose is achieved in part by the State supervisory officials allowing the granting of non-published goods rates through the agency of special companies which, as forwarding agents or similar concerns, come under the control of the railways.

However valuable the concessions which have been made in the obligations of the railways as defined by law may be in isolated cases, it is indisputable that no railway today still expects the problem to be entirely solved by these measures. Even in the countries in which the rates and liability to the obligation to publish rates and to operate has been most relaxed, the railways attach importance not only to defensive measures of their own but also and especially to effective legislation on motor vehicles.

Taxes on motor traffic.

The taxes imposed on motor transport.

A distinction should be made between the various forms in which the road motor vehicle is taxed : a fixed sum to be paid for owning a motor vehicle, taxes on the fuel consumed or on the tyres, professional taxes on motor transport undertakings, and taxes imposed on individual transport for reward. As regards their purpose, the taxes may be divided into contributions for meeting the general financial requirements of the State, and contributions for covering the cost of road maintenance. When new or higher taxes have been imposed upon motor vehicle traffic in recent years, it has been stated either in the laws themselves, or in the explanatory report dealing with them, that these fiscal measures are also intended to serve to bring to a common level the conditions of competition between rail and road.

If the various countries of the world are regarded as a whole, there is no doubt that the development is proceeding in the direction of higher taxation of motor vehicles. There is an unmistakable tendency to tax the motor vehicle more and more in proportion with the road wear they cause. Even in countries which originally knew only lump sum taxes, there is a growing tendency to introduce taxes depending upon the extent of utilisation of the vehicle. However, besides these taxes, fixed taxes are still considered indispensable; in certains countries such taxes were introduced during the last few years, or have been increased recently.

Nonetheless, everywhere experience has shown that a satisfactory solution of the road-rail competition cannot be obtained by taxing alone.

Concessions for road motor services. Legal requirements.

The regulations governing regular passenger transport services are substantially the same in nearly all countries. Sometimes the railways or the Post Office are given a privileged treatment. In general the regulations governing regular passenger services have given satisfactory results. It has, however, been found that occasional passenger transport should be more strictly controlled

by the State. This is why, in recent times, the tendency has been noted to extend the licensing laws to occasional transport carried out in a professional capacity.

With regard to goods transport, licensing regulations may be classified into the following four groups :

1. Countries in which lorry traffic is still free from licensing legislation. The number of these countries is steadily decreasing.

2. Countries in which both goods and passenger transport is subject to a licence only in the case of regular public services. The number of these countries also decreases from year to year, since it is realised that lorry traffic occurs principally in the form of irregular journeys and over varying itineraries.

3. Countries in which irregular transport by lorry requires a licence, but where the object of the legal prescriptions is merely to regulate the competition of the two methods of transport, without any desire to establish collaboration. In most cases, before licences are granted, the need for such services is investigated into. Regulations are imposed to an increasing degree upon the undertakings granted licences. These refer in part to the commercial organisation of the business, and the operation, notably the pay and working hours of the employees, and in part to the minimum and maximum rates. In some countries, it is prescribed, for the protection of the railways and of their rates, that motor transport must not undercut certain officially fixed rates. Checking whether the conditions imposed are faithfully carried out has proved itself everywhere to be difficult and expensive, and checking whether the prescribed tariffs are adhered to has proved to be practically impossible. Up to the present, the limitations imposed on the motor vehicle undertakings with regard to distance and area have proved themselves to be the more effective for the protection of the railways. In many countries, a licence is granted only for certain maximum distances, individual connections or certain districts.

4. Countries in which, in conjunction with licensing regulations, an endeavour has been made to bring about some co-ordination between railway and road traffic. In view of the failure of other regulations as regards concessions, several States have adopted this solution in recent years. The avowed intention is to strengthen the State-controlled public services, whatever the method of transport used, as opposed to private transport relying on the motor vehicle. If the railways, as is generally the case, are conceded a leading place in this work carried out in common, this solution approaches the transport monopoly for the railways. Furthermore, this solution aims also at the creation of a certain monopoly in favour of the railway, when within the scope of the common work, transport by motor vehicle is allowed merely for short enough distances.

The experience which has so far been gained of regulations of the above mentioned kind has generally been regarded by the railways concerned as fairly satisfactory.

Apart from one exception, no State has hitherto limited the genuine works transport (Werkverkehr). Contrariwise, regulations which restrict or even entirely prohibit the utilisation of private vehicles for the transport of goods against remuneration are on the increase. At the present time it is impossible to say whether the entire release of purely private transport over all distances will be endurable for the railways and for the public. According to experience obtained so far the interdiction of purely private transport by lorry

against remuneration also indirectly affects the distance of purely private transport. Every legislative measure which aims at the direct limitation of purely private transport will certainly meet with great resistance from economic circles.

Defensive steps taken by the railways.

Measures affecting the operation and traffic services of the railways.

The majority of the railways have endeavoured to improve their services in such a way that the collection of goods at the place of consignment and their final delivery to destination is facilitated, and every unnecessary stoppage between the receiving of the goods and their conveyance, and between conveyance and delivery is avoided. For the same purpose, on many railways the loading service has been improved, partly by the use of better loading appliances and partly by measures of organisation. The alterations in the transhipment service, by means of which the number of transhipment operations and the number of transhipping stations have been reduced, are especially important. The piece goods traffic has by reason of these measures been greatly speeded up on most railways in the course of the last few years. In the majority of cases the cost of this part of the working has been reduced at the same time.

On many railways an acceleration of the train services has been attained by the adoption of electric traction. Another means of attaining the same object has been the use of railcars and of short steam trains. On many railways the commercial speed of the trains has been improved, by increasing the running speeds, and by redistributing the work to be performed by the trains, there being a sharper delimitation between short-distance traffic and long-distance traffic, which has reduced the number of intermediate stops. The influence of road competition on the railway timings differs, however, greatly from one railway to another. Sometimes, there appears in passenger traffic, as a result of competition, the clear tendency not only to increase train frequency, but also to introduce a so-called rigid timetable with uniform intervals between the various train services. On the other hand, there appears in passenger traffic a tendency to supplement the timetables by putting on trains to deal with particular traffic peaks. In goods traffic there prevails, contrariwise, the tendency to make the train services more regular than in previous years, in order to bring into greater prominence the advantages which railway transport offers with regard to regularity of delivery, as opposed to the more flexible motor vehicle.

With reference to the special importance which has already been attached to the measures in connection with methods of operation and the compilation of timetables, when the contents and purpose of the reports were fixed, we will give further details regarding the results obtained from these measures, especially from an economic point of view.

It is of course economically correct to adapt as far as possible the working to the volume of the traffic, and therefore to substitute smaller motive power and train units for the larger trains, if they are sufficient to cope with the traffic. However, it is only by an investigation into the extent and nature of the tasks of each individual railway and of each line that, in view of the fluctuations in traffic, it can be judged to what extent such a procedure is practicably possible and actually economical. In the same way, it is only by taking into account the conditions on each railway that it can be decided whether the replacement of a smaller number of long trains by a larger number of shorter and lighter trains promises economic suc-

cess. As regards the costs of actual train traction, high-speed trains are as a rule more economical, especially in serving stretches of considerable length, than are slower trains. They sometimes require, however, a higher expenditure on maintenance costs for engines, carriages, permanent way and track, as also to some extent considerable expenditure of new capital for the permanent way, for safety devices and facilities for overtaking. It is seldom that a striking economic advantage can be expected on the side of expenditure, as a result of the altered working method. Whether, however, increased receipts are to be anticipated to an adequate extent from an increase of traffic depends, not only upon the kind and volume of the traffic offered, but above all upon the amount of the cost of transport. As a rule, an appreciable increase in traffic cannot be attained in the long run, even with a considerable improvement in the conveyance from the operating point of view, if it is necessary to increase the cost of transport in order to cover larger capital investments or heavier current expenses. The evolution of the economic conditions, which has been dealt with in a more detailed manner in the first part of this report, and the competition of the motor vehicle have made the users extremely sensitive in this respect. It appears reasonable to believe that the position of the railways will become increasingly serious in this connection.

In cases where the railway network is not so dense as the road network, and where it is a case of traffic which can only be handled by rail over roundabout routes, or with extensive assistance from road hauliers as regards collection and delivery, as very often occurs on secondary railways, small lines (Kleinbahnen) it should be asked, when a renovation of operating methods is planned, whether putting into service road vehicles and restricting railway traffic would not promise greater profit. In general, the public would doubtless be more willing to accept to pay higher charges for conveyance by motor vehicle. This applies, for instance when the public is saved displacements and expenditure which would have to be faced for the actual conveyance outside the railway.

Tariffs.

In connection with competition from motor vehicles a highly important point has been and still is the granting of special rate reductions, since in almost all countries only part of the traffic is threatened by road competition. Even in those cases where general rate reductions have been carried out, the necessity has been shown of granting in many cases special reductions, while as a rule the tribute paid by revenue as the result of the general reduction in rates is not balanced by a corresponding increase in traffic. As regards passenger traffic, the railways are endeavouring to secure, with the help of rate reductions, all the bulk traffic. For this purpose, rate reductions have been granted practically everywhere for the passenger traffic of large parties and for excursion traffic occurring on certain days of the week, on Saturdays and Sundays, at holiday times and on other occasions. In the case of goods traffic, on the other hand, there is a tendency, as regards tariffs, to retain the custom of the bigger consignors, by granting them freight reductions on condition they remain faithful to the railway. In many countries special concessions have been made in the case of grouped traffic (Speditionssammelgutverkehr), in order to counteract the increasing interest taken by the forwarding agents in motor traffic.

The importance of tariff measures becomes ever plainer in all countries. Thereon will also depend, in the future, the success or failure of the fight against

competition as regards long-distance goods traffic, unless it be possible to impose equal rates to the road motor or to bind the motor vehicle, to restrict competition by a rational coordination of rail and road traffic.

Defensive steps taken by the railways in connection with the ancillary operations inherent in rail transport.

Measures in this field mainly apply to goods traffic. For the railways, it is here primarily a case of counterbalancing the advantages which the motor vehicle can offer for direct transport from door to door. In this connection more and more railways are favouring the container. For the same purpose there have been created in many cases door to door rates or at least rates including the cartage of the goods, porterage. Especially in recent years, the majority of railways have given their attention to improving the organisation of their cartage service for their rail-borne traffic, reducing its costs and its charges. For this purpose, various methods have been adopted. In general, the cartage service has been left in the hands of forwarding agents and carriers, although in recent times a greater interest has been taken in its activities by the railways. A cartage service operated by the railways themselves or an increase in the cartage done by forwarding concerns, which are affiliated undertakings of the railways, is to be noted in a few countries only. It has, however, been found in all countries that the reduction in cartage rates made necessary in order to compete with the motor vehicle, cannot be carried out by forwarders and carriers entirely unaided. Several railways have decided, therefore, to grant subsidies to the cartage service.

Participation of the railways in motor transport.

An obstacle in this connection has been presented by the fact that it is not yet clear which direction the State transport policy will finally take.

In several countries there still exist legal provisions which completely exclude the railways from certain kinds of motor transport. Such restrictions have, however, been dropped to a great extent in the course of recent years. Sometimes the position has, as already mentioned previously, been changed to the extent that a preferential treatment is granted to the railways as regards passenger lines or, in connection with goods transport, the railways have, under various forms been given the leadership in the division of the work between rail and road traffic or its coordination. Thanks to measures of the last mentioned kind, the activity of the railways in motor lorry traffic has certainly been increased especially in the countries in which at the same time the closing down of railway lines or of individual stations has been facilitated.

These various alterations in legislation have largely contributed to the material increase of the motor traffic worked by the railways in the majority of countries in the course of recent years. In some cases, however, their participation still relates only to the passenger service, in others only to the goods service. If we consider the whole of the railways, we notice above all an increase in their motor lorry traffic. This is mostly restricted to short-distance traffic in which the motor vehicle is being more and more employed in order to improve the parcels traffic. As to the transfer of complete wagon loads from rail to motor lorry, this has not shown itself to be economical so far even on lines with light traffic.

Therefore, light railways in particular have closed their lines not for the whole of the traffic but only for parcels and passenger traffic. A similar course has been followed hitherto by most of the

main-line railways when substituting road transport for rail transport on their secondary lines. It is only in exceptional cases that the main advantage of such conversion has been found solely upon the side of expenditure. As a rule, the increased traffic by the acceleration of transport and by the extension of the field of activity of the railways has been the aim. And often the end in view was less the advantages to be obtained at once than the more efficient securing of the traffic and the future position of the railway. Sometimes a financial loss for the present has been deliberately accepted, in order to protect in the long run the railways and the public services more effectively against the private transport activities which are extending with the help of the motor vehicle, and in order to also retain the long-distance traffic for the railways for the future also.

In judging the question as to whether preference should be given to the motor vehicle services worked by the railways themselves or by a contractor in their service, there exist differences of opinion. In the great majority of cases, up to the present, the railways have however decided, at least in the case of goods traffic, either to employ solely the services of a contractor or to make use of a mixed system. As regards expenditure, the saving, which is usually relatively small, is balanced by the additional current outlay for the loading service, and in part by additional financial burdens as a result of fresh capital expenditure for plant.

INTERNATIONAL RAILWAY CONGRESS ASSOCIATION

Enlarged Meeting of the Permanent Commission
(4-6 July 1935).

Summary of sectional proceedings.

QUESTION II :

« The World Crisis and Railways

and the effects of the crisis on railway working; measures taken to lessen the effects of the crisis; competition or collaboration between railway and road transport; a forecast of the future; new ideas as to passenger transport, such as light quick trains between large towns and between large and small towns, running at regular intervals. »

Preliminary documents.

Report *(Main-line Railways of all countries except those affiliated to the International Railway Union)*, by Mr. ASHTON DAVIES. (See *Bulletin*, June 1934, p. 525.)

Report *(Main-line Railways affiliated to the International Railway Union)*, by Dr. COTTIER and Herr VON BECK. (See *Bulletin*, December 1934, p. 1277.)

Report *(Secondary Railways in Countries of Southern Europe and their Colonies)*, by Messrs. E. LA VALLE et E. MELLINI. (See *Bulletin*, April 1935, p. 365.)

Second report *(Same Railways as above)*, by Mr. ASHTON DAVIES. (See *Bulletin*, July 1935, p. 771.)

Second report *(Same Railways as above)*, by Dr. COTTIER and Herr VON BECK. (See *Bulletin*, September, 1935, p. 1105.)

Second report *(Same Railways as above)*, by Messrs. E. LA VALLE and E. MELLINI. (See *Bulletin*, July 1935, p. 791.)

Special report, by Herr VON BECK. (See *Bulletin, September* 1935, p. 1147.)

Meeting held on the 4th July 1935 (Afternoon).

Sir RALPH WEDGWOOD, Chief General Manager, London and North Eastern Railway, in the Chair.

THE PRESIDENT opens the Meeting at 2.30 and installs the Bureau. On behalf of the Permanent Commission he proposes :

— As Vice-Presidents :

Mr. KOLLER, Engineer, Head of Section, Ministry of Railways of Czechoslovakia, and

Mr. MARGUERAT, Manager, Viège-Zermatt Railway;

— as Principal Secretary : Mr. MINSART, Engineer, Belgian National Railways Com-

pany (Assistant Secretary, International Railway Congress Association), and as

— Secretaries : Mr. Newbold, Agent General, Southern Railway, England, and Mr. Despret, Engineer, Belgian National Railways Company (Assistant Secretary, International Railway Congress Association).

— The Meeting approves these proposals.

The President opens the discussion and calls on Mr. von Beck, who gives a résumé of his special report.

Mr. von Beck *(Special Reporter)* explains that the reporters have made an effort to establish the causes, of the railway crisis and that they have come to the conclusion that the present position of the railways may be ascribed to two causes, the one being the world economic crisis, and the other the crisis peculiar to transport, brought about by competition from other means of transport.

In regard to the world economic crisis, it has been found that the development of countries overseas has caused a deep and lasting perturbation in the economical situation.

Since the war, the establishment of new industrial centres and the displacement of markets has given rise to an evil which it will not be possible to remedy completely. On the other hand, in the European countries traffic has fallen off owing to new ways of producing and using power, which brought about a decrease in the coal traffic. Furthermore, the reclaiming of new farming land led to decreased imports.

Amongst methods of transport which compete with the railway, the road motor vehicle should be considered foremost, as competition from waterways is nothing new.

As regards motor competition, the technical point of view does not predominate. What specially handicaps the railways is a sort of favour enjoyed by motor transport, in the sense that legal provisions are rather favourable to motor transport, or a least are not unfavourable enough to it. The crisis which affects the railways will last if only volume of traffic is considered, and will exert a constant pressure upon railway rates.

Mr. Cottier, Reporter, stresses the remark made that the tense situation in the transport regime must be laid down to the unequal legal conditions, which weigh heavily on the technical conditions.

The drop in railway traffic will be of a lasting nature, and the railway rates are subjected to constant pressure, which will be lasting also because the user can nowadays do without the railway, and enjoy lower rates by using the motor vehicle.

Mr. von Beck calls attention to the charges with which railway transport is now burdened. This factor, together with the pressure exerted on its rates by motor competition should be taken into consideration when deciding upon the policy to be followed in the matter of new constructions. The question as to whether the capital to be invested in new constructions will be counterbalanced by additional receipts should be examined very carefully. Examining the economic position in most of the European countries, the Special Reporter came to the conclusion that the most unfavourable conditions for the railways occurred towards 1932. Conditions somewhat improved since then in a few countries; it would be a mistake to think, however, that this is a permanent and general improvement,

seeing that in most cases it was the result of governmental action taken either to reduce unemployement or for other reasons.

Be this as it may, no railway regained the position it was in in 1929. Owing to governmental intervention, it is difficult to exactly define the present-day position of the railways as regards the crisis. The road-rail problem has nowhere been solved, and remains doubtful. The chief difficulty lies in the fact that Governments have not defined their policy in the matter of transport, which leaves the railways in a state of uncertainty as to the attitude to be adopted.

The question of motor competition may be solved in two ways : either by altering the legislation on railways or by modifying the regime of road transport.

Little can be done as regards the first point. Contrariwise, a modification of the principles governing the taxes on motor transport should prove efficacious. This question is now being examined in most countries. Action can also be taken by setting up a concession system, as has been done in many countries; the present trend, however, is towards the fostering of actual collaboration between the two methods of transport.

In the matter of tariffs, a general rates reduction is worse, from a financial point of view, than motor competition itself. The best course is to reduce rates in given cases only.

The railway should endeavour to keep hold of big tonnages and also to develop transport under contract.

Mr. Cottier states that this « fidelity » clause is of growing importance in the matter of railway tariffs.

Mr. Henning *(Belgian State Railways)* is of the opinion that not only should the bulk of the goods carried for a given consignor be considered, but also the grouped goods sent from a given town.

Mr. von Beck mentions another point that should not be overlooked, the improvement of the service offered, which may effected by : speeding up the trains, running shorter trains instead of long ones, accelerating the conveyance of parcels. Electrification, the use of railcars, sometimes the carrying out of new works, may improve the service. In no case, however, should these measures necessitate increasing the rates; for making good new expenditure, increased traffic and not increased rates should be reckoned upon. Door to door collection and delivery and the use of containers are means by which to retain the patrons, care being taken, however, that the cartage charges do not fall on the latter, but are as far as possible included in the rail rates, as with the British system.

Mr. Cottier confirms Mr. von Beck's statement as regards collection and delivery, and thinks that the railways would benefit by such an organisation, even if they had to pay a subsidy for this service.

The President confirms that the British Railways have for a long time organised door to door collection and delivery and that no special charge is made in this connection.

Mr. von Beck mentions that, for some time, almost all railways operate motor transport services, either by themselves or in collaboration with private undertakings. Very seldom has a railway line been radically abandoned; part of the passenger and parcels traffic is generally made over to the road, the remainder of the traffic being carried by rail.

As a rule, these motor services were not remunerative; they must, however, be kept working in order to retain the traffic and await a possible improvement in the future.

Mr. Ashton Davies recalls that he expounded the question under discussion in two reports which were published in the *Bulletin*, and points out that he described conditions in the United States of America at considerable length, as it is doubtful if any other country presents such a variety of operating methods.

Mr. Ashton Davies states that the world crisis which gave rise to trade depression has diminished railway revenue. Some companies have failed to meet their fixed charges, but only a few now show an actual deficit.

Road competition, which would probably have arisen independently of the world crisis, has added to their difficulties, it being the more unfortunate that the crisis should have coincided with the period during which road competition is most keen. In addition to unregulated and uneconomic competition by road transport undertakings, the transport by small private cars has undoubtedly withdrawn an appreciable number of clients from the railway.

Almost everywhere legislation is being sought to co-ordinate the various methods of transport and eliminate wasteful competition. New Zealand and Ireland have made good progress in this direction, and a varying measure of success has attended similar efforts in other countries. Though some progress has been made, much yet remains to be done before a satisfactory position is reached. In South Africa, animal transport by road is a serious menace.

Air services too are competitors whose influence is felt in America, while in South Africa, the Railway Administration has assumed control of certain air services.

Amongst methods adopted to fight road competition, improved services on suburban lines is very important. Endeavours have been made, too, to popularise rail travel by means of better rolling stock and increased amenities. Another remedy, of almost universal application, is rates reductions. In this case there is no uniform method, conditions differing widely, with the result that in practice classes of traffic are dealt with on their own merits. As regards passenger traffic, for example, reduced fares have not, in some instances been followed by a sufficient increase in business to compensate for the loss in revenue due to such reductions, and this emphasises the necessity of giving full consideration to the potentialities of a given area, before coming to any decision.

Reduced receipts have prompted all Administrations to explore every avenue leading to reduced expenses. It has been found possible to effect savings in respect of staff, operation, maintenance of fixed equipment, motive power und rolling stock, etc..

Standardisation has been of good assistance; job-analysis has contributed good results in India. In many countries abroad, native labour is remarkably cheap, with the result that no savings would accrue from the introduction of specialised equipment for say, permanent way work.

Mr. Ashton Davies mentions that he has had to deal with light train units which, under certain circumstances may appear to be satisfactory; he cannot certify they are to be recommended everywhere. Light units are chiefly to be considered in connection with supplementary suburban services. In other cases,

high-powered railcars operating at high speed between large towns have been used, e.g. the experiments being made in America.

To conclude, he states that without exception, railways have suffered severely from the effects of the crisis. The seriousness of the position has incited them to adapt themselves to the change brought about by the contraction of world trade, and the inroads of modern innovations into transport. The experience resulting from new economic schemes, reorganisation, standardisation, will probably confer a lasting benefit. Signs are not wanting that the worst period has passed and a study of the revenue position of the Companies reported upon reveals a stemming of the attrition caused by the crisis, and a partial recovery, which may be the more permanent because of its gradualness. The net revenue position of many Companies is better, chiefly bebecause of the economies effected in operation. Recovery is still to a certain extent retarded by tariff limitations and financial difficulties due to variations in currencies, which have their repercussions on the business available for railways, the prosperity of the latter, of course, depending on the general economic position of the country.

Nevertheless, the flexibility and adaptibility of Railway Administrations have enabled them to respond vigorously to the challenge and to give at the same time a complete public service; the energy they have shown in applying themselves to mastering the present difficulties augurs well for their future recovery and prosperity.

Mr. La Valle *(Reporter)* explains that, in order to gather data for his second report, he sent out a restricted questionnaire, one of the questions put being related to the effect of the depression on the railway concerned, especially as regards the goods traffic, the steps taken, and such other information as might prove interesting. The replies of the railways were satisfactory; however, they show that the position has not improved. Receipts are still falling, at a slower pace, it is true. Traffic is also decreasing.

No new measures were taken neither in the matter of legislation nor in other fields.

Consequently, Mr. La Valle thinks this question should remain on the agenda.

Railways go on suffering from the crisis and no definite appreciation can be voiced. The railways have reduced expenditure to such an extent that no further savings can be considered.

At the conclusion of these comments by the Special Reporter and the Reporters, and as suggested by the President, the decision is taken to postpone the discussion till the Meeting to be held the following day. The President, also suggests that the subject of the discussion be the proposed summary. The wording hereafter appears to sum up the general opinions expressed in the reports.

Proposed summary.

« The greatest possible efforts have been made by the railways to meet the difficulties resulting from the world crisis. The present improvement is possibly only temporary.

« Their position is still imperilled by free or little regulated road competition, which is harmful to industry and the public well-being.

« It is absolutely essential that road transport be subjected to such obligations as will result in reasonable equality between the two methods of transport. »

Meeting held on the 5th July (Morning).

Sir RALPH WEDGWOOD in the Chair.

— The Meeting is opened at 9.30 a.m.

THE PRESIDENT suggests that the draft summary drawn up after the Meeting held on the previous day be taken as the basis for the discussion.

Mr. MEREUTZA *(Rumanian Rys.)* gives particulars in respect of the fluctuations of operating receipts and traffic in his country, and calls the attention of the Meeting to a legal enactment which probably is not in force in any other country. The Government had built good roads, some of which could compete with the railway, the more so that they are parallel to the railway lines. The Management of the Railways have caused a law to be voted, which enables them to control the roads which are parallel to the railway.

Mr. KOLLER, Vice-President *(Czechoslovak State Rys.)* mentions the main provisions of the new law, put into force in July of this year. This law simplifies the regulations governing taxes on goods transport, and also establishes a discrimination between road (lorry) transport undertakings having agreements with the railways, and those which have not.

This law makes it possible for the railways to seriously control transport which up to the present had been absolutely free. This transport is that carried out by private undertakings which own 5/6ths of all the motor lorries now operated in Czechoslovakia, and were not subjected to any regulations up to the present time.

After these general remarks, the President opens the discussion on the proposed summary.

Mr. VON BECK proposes to alter the text. He considers that it is going too far to claim equal conditions. The technical features are different. It would be better to claim an approximation of conditions, a lightening of the obligations imposed upon the railways by the State, and a restricted liberty for road transport (lorries).

Mr. COTTIER seconds this point of view He suggests that it be stated in the summary that it is desirable that the conditions under which both methods of transport are operated be made to approximate. A lightening of the obligations in respect of tariffs, imposed by the State, is also desirable. On the other hand, the freedom now enjoyed by the motor lorry should be somewhat restricted. It is not equality from the legal point of view that should be sought, but an approximation, and the principle should be stated of rational collaboration between rail and road, which is only possible if approximation of legal conditions exists.

Mr. HENNING is of the opinion that the case should be clearly stated. We are all agreed that the burdens of the railway must be lightened, but the laws which govern railway operation should also be altered, made more flexible, even in the matter of tariffs as stated by Messrs. VON BECK and COTTIER. If it were not possible to grant the railway complete freedom as regards rates, we should come to an agreement as regards the alleviation to be claimed.

Mr. VON BECK, to make his meaning clear, states that it is absolutely indispensable that from the legal and financial points of view, the regulations which govern the two methods of transport be made alike as far as the difference in

their technical features and the interests of the national well-being permit.

Mr. KOLLER suggests a wording claiming more extensive alterations, making for true equality. Both methods of transport should bear the same burdens so that neither the one nor the other be privileged.

Mr. DE SPIRLET *(Nord-Belge Lines)* proposes to say « equality of treatment » instead of « equality », but does not insist.

Mr. ASHTON DAVIES points out that the present improvement in railway working, if considered from the point of view of the receipts, is slight, and may be only temporary.

Mr. FIORI *(Italian State Rys.)* supports this statement, as the improvement noticed only affects a few railways, and consequently it would be excessive to speak of a general improvement.

Mr. HENNING thinks the first sentence should be altered, as it would be excessive to say that the railways have made « the greatest possible efforts » to meet the crisis.

Mr. FIORI wishes that it be stated whether free road competition is harmful to the transport industry in particular, or to industry generally.

THE PRESIDENT is of the opinion that it is harmful to industry in general.

After this exchange of views the summary is revised and the wording hereafter is adopted by the Meeting.

SUMMARY.

Great efforts have been made by the railways to meet the difficulties resulting from the world crisis. The present slight improvement is not general, and possibly only temporary.

Their position is still imperilled by free or little regulated road competition, which is harmful to trade and industry and the public well-being. It is absolutely essential that road transport be subjected to such regulations as will result in reasonable equality between the two methods of transport, having regard to their technical differences and the national interests.

* * *

The text of this summary was ratified, except for a few alterations, by the Plenary Meeting held on the 6th July 1935. (See Proceedings and final summary on pp. 1169-1171 and 1175 of this *Bulletin*.)

[385.1, 621.43 & 656]

INTERNATIONAL RAILWAY CONGRESS ASSOCIATION

Enlarged Meeting of the Permanent Commission
(4-6 July 1935)

Plenary Meeting held on the 6th July 1935.

PROCEEDINGS.

Mr. Rulot, *President of the Association, in the Chair.*

— The Meeting is opened at 10.30.

The President states that two points are on the agenda :

1. Examination of the summaries relating to questions I and II, as adopted by the Sections.

2. Examination of the list of questions proposed for the agenda of the XIIIth Session, and appointment of the Reporters.

The President requests Mr. Ghilain, *General Secretary*, to read the proposed summaries in respect of question I : *Rail motor cars from the point of view of their construction.*

Mr. Ghilain suggests that these summaries be read and discussed successively, and states that a few slight alterations have been proposed.

He then reads *Summary I :*

« I. In the opinion of most railways, rail motor cars are just what is wanted to satisfy the public demand for faster services, and the lower cost of the railcar-mile makes it possible to effect operating savings.

« Consequently, these railways have ordered large numbers of railcars, necessarily of varying types, as the prototypes are still in the experimental stage.

« Over 750 railcars or rail motor trains are at present under construction or on order, to 85 different designs.

« Railcars with internal combustion engines (especially diesel-engined) are generally preferred at the present time. »

Mr. Ghilain suggests that the first paragraph be modified as follows :

« In the opinion of most railways :

1. Rail motor cars are just what is wanted to satisfy the public demand for more frequent and, in some cases, faster services.

2. The lower cost of the railcar-mile makes it possible to effect operating savings. »

— No objection being raised, Summary I is adopted, the first paragraph being altered as stated above.

Mr. Ghilain reads *Summary II :*

« II. Steam railcars have given satisfactory results, especially in Great Britain, where a considerable number are in service, but where the use of railcars is not being extended owing to operating conditions.

« The steam railcar of the *Doble* system, entirely automatic and condensing, the first example of which has been running in Germany since last year, appears to have a great future when the delicate

technical features of the design have been perfected. »

Summary II is adopted, subject to the following alteration in the wording of the second paragraph :

« The entirely automatic condensing steam railcar, such as the *Doble* system, the first example of which... »

Mr. Ghilain reads *Summary III* :

« III. In Italy, France, Czechoslovakia, and Sweden, petrol engines are favoured, especially for light railcars. When the same fire precautions are taken as on aircraft, the fire risk inherent in petrol should be definitely lessened. »

He suggests the *United States* be added to the countries mentioned.

Mr. Mugniot *(Paris-Lyons-Mediterranean)* proposes to say « fast and light railcars » instead of « light railcars », seing that the petrol engine weighs less than the diesel and allows of higher speeds than the latter.

Mr. Dumas *(French Nord Railway* and *Special Reporter)* thinks the first wording should stand.

Mr. Le Besnerais *(French Nord Ry.)* mentions, as an example of fast railcar, the *Bugatti*, which is much lighter than the fast diesel-engined railcars. That is why the word « light » was deemed to well characterize, in each class, the petrol-engined railcars.

After an exchange of opinions between Messrs. Le Besnerais, Mange *(Paris-Orléans Ry.)*, Mugniot, Dumas, Nicolet *(French State Rys.)* and Levy *(French State Rys.* and *Reporter)*, the Meeting adopts the wording : « especially for railcars with a high power—to—weight ratio » instead of « especially for light railcars ».

It is also agreed that the *United States* will be added to the list of countries, and Summary III is adopted with these amendments.

Mr. Ghilain passes on to *Summary IV*.

« IV. Minimum costs of maintenance, and especially of the periodic overhauls, are the principal factors deciding the diesel engine selected. The value of minimum weight per horse-power must also be borne in mind.

« Diesel engines of many designs and of 250 to 300 horse-power and even over are now available for railcar purposes.

« The various triplet rakes in existence are fitted with 400-h.p. engines and over, the only exception being the Danish rakes which have four diesel engines, each 250 h.p. These engines are so improved today that they can be relied upon to work the services very well.

« In order to make sure of their diesel engines running reliably, most railways take the greatest precautions in connection with their fuel oil which generally complies with certain given technical specifications, and is filtered and decanted before use.

« A great effort is now being made to perfect the high-speed two-stroke diesel engine in the hope of saving an appreciable amount of weight relatively to the four-stroke engine. Supercharging is also under test. »

Mr. Ghilain proposes to say in the first paragraph « the type of diesel engine selected », instead of « the diesel engine selected ».

Mr. Mange points out that this modification alters the meaning conveyed by the first wording, and now implies that a selection has to be made between the

different types of *diesel* engine exclusively.

Mr. GHILAIN states that the suggested alteration was made in agreement with Mr. DUMAS.

— The modification is adopted.

Mr. GHILAIN furthermore suggests that in the 4th paragraph « fuel oil which generally *complies* with... » be replaced by « fuel oil which generally *has to comply* with... ».

— The latter alteration is also agreed and Summary IV is consequently adopted.

Mr. GHILAIN reads *Summary V* :

« V. Mechanical transmission has gained ground over electric transmission during the last two years, especially in Europe. It is commonly employed now up to 250 and 280 H.P. and, contrarily to what might be feared, does not seem to fatigue the diesel engine. It has the advantages of efficiency and light weight. The free wheel or a hydraulic flywheel complete it in a happy manner.

« Electric transmission is still preferred in the United States for all applications, and in Europe for high powers. However, it imposes a heavy strain on the diesel engine if not perfectly adapted to it.

« Hydraulic transmission has not yet proved its value above 150 H.P. approximately, but much may be hoped for from the three 1 200-H.P. triplet rakes of the Reichsbahn, which are to be fitted with hydraulic transmission.

« The hydraulic transmission has the additional advantage of providing supplementary braking power. »

Mr. GHILAIN, in agreement with the Special Reporter, Mr. DUMAS, proposes to say « up to 300 H.P. instead » of « up to 250 and 280 H.P. ».

— Summary V is adopted with this alteration.

Mr. GHILAIN reads *Summary VI* :

« VI. Railcar bogies are generally lighter than those used on ordinary rolling stock. They are fitted with double suspension in some cases, and single in others.

« To prevent hunting at high speeds, many railways are fitting shock absorbers, so far with satisfactory results. Others have improved the riding by reducing the conicity of the tyres.

« The engine is usually carried on the bogie. Experience, however, has shown that the passengers can be made practically as comfortable when the engine is located in the body as when it is carried on the bogie. »

— Adopted.

Mr. GHILAIN reads *Summary VII* :

« VII. Drum brakes are satisfactory on light railcars. On heavy railcars, the block brake, with or without automatic regulation of the pressure in terms of the speed, is more generally used. The electromagnetic brake remains an interesting proposition, at least as a standby brake, in spite of the drawbacks found in service. »

In agreement with Mr. DUMAS, Mr. GHILAIN suggests the wording hereafter for the first part of this summary.

« Drum brakes of the automobile type are satisfactory on light railcars. On heavy railcars, the brake with blocks acting on the tyres or drums... »

— Adopted with the above alteration.

Mr. GHILAIN reads *Summary VIII*.

« VIII. The use of special metals (alu-

minium, high tensile steels, such as « Stainless » and special steels, such as « Corten ») has not resulted in such large weight savings as would be expected from the relative specific weights or tensile strengths.

« Most railways still prefer carbon steel; some railways, however, use special steels in new stock, to strengthen the body against shock, in addition to lightening it to some extent. »

Mr. GHILAIN suggests the following wording for the beginning of the second paragraph :

« Most railways, *therefore*, still prefer... »

— Thus amended, Summary VIII is adopted.

Mr. GHILAIN passes on to *Summary IX:*

« IX. Bogie railcars are used even on secondary lines for comfort and steadiness at high speeds in place of four-wheeled railcars, which only survive in the case of very small units.

« As regards the bogies themselves, experience has shown that the combination of laminated and coiled springs, completed by a reasonable use of indiarubber, gives the greatest comfort. Up to the present time, any additional comfort due to the use of elastic wheels is not in proportion to the additional maintenance cost involved.

« The suppression of noise is at least of equal importance for comfort.

« Ventilation is also a matter of great moment. Some Companies have gone so far as to consider complete air conditioning in order to give the greatest possible comfort. »

Mr. MUGNIOT asks for explanations as to what is meant by « complete air conditioning », and an exchange of views ensues between Messrs. LE BESNERAIS, NICOLET, DUMAS, BALS *(Rumanian State Rys.)* and MUGNIOT. The result is that the expression « complete air conditioning » implies conditioning in respect of air heating and cooling, i.e., conditioning throughout the year. Consequently, the Meeting decides that the words « complete air conditioning » will be replaced by « air conditioning throughout the year ».

— Summary IX is adopted with this alteration.

Mr. GHILAIN reads *Summary X* :

« X. There is a tendency in all countries to increase the capacity of railcars or a desire to be able to vary the capacity according to traffic requirements. Many Companies are consequently now using either multiple-unit sets, or cars coupled together or to trailers.

« In multiple-unit sets, articulated bogies are generally used and give the maximum of comfort and steadiness. The use of ordinary bogies in place of articulated bogies, however, enables the set to be made longer and overcomes the difficulties encountered when taking out articulated bogies for repairs or as the result of some accident or other. »

— This summary is adopted, except for two slight formal alterations in the *first paragraph* : « *or* a desire to » is replaced by « *and* a desire to »; the other modification only affects the French text, the English version remaining unchanged.

On the other hand, the word « accident » is attenuated into « incident ».

Mr. GHILAIN reads *Summary XI* :

« XI. In view of the valuable conclusions come to in several countries through using the Ferrand-Rousselet method of calculating the characteristic constants of railcars, this method should be used by the largest possible number

of railways, to enable them to compare their modern railcars. »

— Adopted without any remarks.

Mr. GHILAIN reads *Summary XII* :

« XII. Experience shows that the essential factors in railcar costs are the maintenance costs and the amortization charges. All Companies are endeavouring to reduce their maintenance costs at the present time, even if it means some increase in fuel costs.

« In connection with the amortization charges, any special fixed equipment which may be necessary has to be taken into account; savings can be effected by adapting railcar working conditions to the stock and by the training and specialisation of the staff.

« In many countries, the cost of the railcar-mile with many types of railcar is considered at the present time to be only one half and even one third that of the steam trains previously working the same service.

« This last finding shows the great value of railcars and the desirability of dealing with the question again at the next Congress, with special attention to the three points in connection with which progress might be made in the near future, namely : transmissions and brakes; comparative test methods; detailed investigation into costs and the methods by which they may be reduced. »

Mr. GHILAIN states there is a proposal to alter the second sentence of the second paragraph as follows : « ... account Savings can be effected by improving the conditions under which railcars are operated, and by the training and specialisation of the staff. »

— Summary XII is adopted with this alteration.

Mr. HUNZIKER *(Swiss Federal Railways)* in respect of Summaries II, III and IV dealing with the different types of engine, points out that light battery-driven railcars, of which Switzerland has introduced several remarkable designs, have not been mentioned.

Mr. LE BESNERAIS replies that these railcars, being fed from a contact line, do not come within the classes of railcar now being dealt with, which can run on any sort of track, without any special installation. Battery-driven railcars were not included into the present investigation, because they are not essentially different from electric locomotives or electric tramways.

Mr. HUNZIKER still points out that, as the major part of the Swiss System is electrified, it would not do to operate under the contact lines railcars equipped with heat engines, but well electric railcars.

THE PRESIDENT in conclusion states that the point raised by Mr. HUNZIKER was not included in the subject matter of the question dealt with, so that it cannot be taken into account as fas as the summaries are concerned. Mr. HUNZIKER's remark will, however, be recorded in the proceedings.

— **The final text of the summaries will be found in the appendix, pages 1173 to 1175 of this Bulletin.**

* * *

THE PRESIDENT then passes on the summary relating to question II : *The world crisis and railways*, and requests M. GHILAIN to read the text adopted by the Section.

Mr. GHILAIN reads the text :

« Great efforts have been made by the

railways to meet the difficulties resulting from the world crisis. The present slight improvement is not general and is possibly only temporary.

Their position is still imperilled by free or little regulated road competition which is harmful to trade and to industry, and to the public well-being. It is absolutely essential that road transport be subjected to such regulations as will result in reasonable equality between the two methods of transport, having regard to their technical differences and the national interests. »

THE PRESIDENT states that a modified wording has been suggested.

Mr. GHILAIN reads the proposed text :

« Great efforts have been made by the railways to meet the difficulties resulting from the world crisis. Some slight improvement in the economic situation is now observable, although it is not general and possibly is only temporary.

« The position of the railways is still imperilled by free or little regulated road competition, which is harmful to trade and industry, and to the public well-being.

« The burdens laid on the railways must be lightened and the legal requirements imposed on them made more flexible.

« It is most desirable that road transport be subjected to such regulations as will result in reasonable equality between the two methods of transport, having regard to their technical differences and the national interests. »

— No remarks are made as regards the first paragraph which is adopted.

Mr. MANGE points out that in connection with the last paragraph, the original wording was more forcible; it said : « It is absolutely essential », whereas we are now content with saying that it is « desirable ».

The Meeting agrees to the first wording : « It is absolutely essential » being retained.

Mr. WEDGWOOD *(London & North Eastern Ry.)* asks that no mention be made, in this paragraph, of « technical differences », and that these words be deleted accordingly.

Replying to the PRESIDENT who asked for some explanations, Mr. WEDGWOOD says that road motor vehicles are simple units running on the public roads, the regulation of which is not only very difficult, but quite different from that applicable to railways.

THE PRESIDENT points out that this wording emphazises the desire the railways have of a differential tariff being applied to the road. He wished this wording to convey that the railways do not wish to seek for preference in the technical field. In other words, the railways can claim unconditional equality.

— The Meeting decides that the original wording « having regard to their technical differences and the national interests » will be retained.

Mr. WEDGWOOD recalls that this is a general statement, which allows of exceptions : in England, for instance, no lightening of burdens has been claimed.

THE PRESIDENT then asks if there are any objections as to the clause :

« The burdens laid on the railways must be lightened, and the legal requirements imposed on them made more flexible. »

— This paragraph is approved.

Mr. Le Besnerais is of the opinion that a new paragraph making a transition between the first and the second paragraphs should be inserted.

He submits the following text to the Meeting :

« The railways are particularly sensitive to the effects of the crisis, because of the regulations and requirements imposed upon them as public services. »

Mr. Mugniot proposes to say « sensitive to the effects of the crisis and of competition... »

The President reads the first paragraph with the additional sentence suggested by Mr. Le Besnerais, as completed by Mr. Mugniot.

« Great efforts have been made by the railways to meet the difficulties resulting from the world crisis. Some slight improvement in the economic situation is now observable, although it is not general and possibly is only temporary. The railways are particularly sensitive to the effects of the crisis and of competition, because of the regulations and requirements imposed upon them as public services.

« The position of the railways is... »

— Adopted.

— The final text of the summaries will be found on page 1176 of this Bulletin.

* * *

The President now bids the Meeting to examine the second point on the agenda : *List of questions for discussion at the XIIIth Session (Paris, 1937) and appointment of the Reporters.*

Mr. Ghilain reads this list, which was drawn up so as to reflect the desire of the Member Administrations, whose advice was taken in this respect.

A few formal alterations are made as the questions are being read.

— The final text of these questions will be found in Appendix 2 to the Proceedings of the enlarged Meeting of the Permanent Commission, pages 1183-1184 of this Bulletin.

Mr. Ghilain then gives the names of the personalities selected as Reporters in the various countries, and makes the Meeting cognizant with the steps taken to appoint the other Reporters.

The full list of the Reporters will be published later on in the *Bulletin*.

The President then closes the Meeting. He thanks the Delegates for the interest they have shown in the work of the Session, and he praises the efforts of the Reporters, whose reports were drawn up in a highly scientific way, which much enhanced the importance of these Meetings.

The President recalls that the two questions dealt with are closely related, as they both touch upon the difficulties railways are encountering at present.

The future may, however, be viewed with confidence, the costs of rail transport being definitely lower than that of road transport, and the day when this difference will alter appreciably is not in view.

It may be hoped, on the other hand, that the very strict regulations which govern railway operation will be made more flexible in the near future and that the laws of political economy will be reverted to again. The costs question will dominate all other considerations in the end, having regard to conditions in respect of comfort and facilities.

THE PRESIDENT concludes by wishing the Delegates a pleasant time while they stay on in Belgium, and a happy return in their respective Countries.

(Loud applause.)

Mr. LE BESNERAIS, on behalf of all the Delegates and especially of those who came from abroad, thanks the President personally and the Belgian National Railways Company for the way they have been welcomed; they will keep the best of remembrances of their stay in Belgium.

Mr. LE BESNERAIS adds that, in view of the present difficulties, these Meetings proved particularly useful, as collaboration between railways is more than ever essential in the fight against competition. We should march closely united towards improvement of operation and retention of traffic.

To conclude, Mr. Le Besnerais says that Belgium perhaps is the country which best can throw into relief the part played by collaboration, such part being summed up in its famous national device : « L'Union fait la Force ».

(Loud applause.)

The Meeting ends at 11.35.

SUMMARIES

adopted by the Plenary Meeting of the Permanent Commission

(6th July 1935)

QUESTION I.

Rail motor cars from the point of view of their construction.

« I. In the opinion of most railways :

« 1. Rail motor cars are just what is « wanted to satisfy the public demand « for more frequent and, in some cases, « faster services;

« 2. The lower cost of the railcar-mile « makes it possible to effect operating « savings.

« Consequently, these railways have « ordered large numbers of railcars, ne- « cessarily of varying types, as the pro- « totypes are still in the experimental « stage.

« Over 750 railcars or rail motor trains « are at present under construction or on « order, to 85 different designs.

« Railcars with internal combustion « engines (especially diesel-engined) are « generally preferred at the present « time. »

« II. Steam railcars have given satis- « factory results, especially in Great « Britain, where a considerable number « are in service, but where the use of « railcars is not being extended owing « to operating conditions.

« The entirely automatic condensing « steam railcar, such as the Doble system, « the first example of which has been « running in Germany since last year, « appears to have a great future when « the delicate technical features of the « design have been perfected. »

« III. In Italy, France, Czechoslova- « kia, Sweden and the United States, pe- « trol engines are favoured, especially « for railcars with a high power-to- « weight ratio. When the same fire « precautions are taken as on aircraft, « the fire risk inherent in petrol should « be definitely lessened. »

« IV. Minimum costs of maintenance, « and especially of the periodic over- « hauls, are the principal factors decid- « ing the type of diesel engine selected. « The value of minimum weight per « horse-power must also be borne in « mind.

« Diesel engines of many designs and « of 250 to 300 horse-power, and even « over, are now available for railcar pur- « poses.

« The various triplet rakes in existence « are fitted with 400-H.P. engines and « over, the only exception being the Da- « nish rakes which have four diesel en- « gines, each 250 H.P. These engines « are so improved to-day that they can « be relied upon to work the services « very well.

« In order to make sure of their diesel « engines running reliably, most railways

« take the greatest precautions in connection with their fuel oil which generally has to comply with certain given technical specifications, and is filtered and decanted before use.

« A great effort is now being made to perfect the high-speed two-stroke diesel engine in the hope of saving an appreciable amount of weight relatively to the four-stroke engine. Supercharging is also under test. »

« V. Mechanical transmission has gained ground over electric transmission during the last two years, especially in Europe. It is commonly employed now up to 300 H.P. and, contrarily to what might be feared, does not seem to fatigue the diesel engine. It has the advantages of efficiency and light weight. The free wheel or a hydraulic flywheel complete it in a happy manner.

« Electric transmission is still preferred in the United States for all applications, and in Europe for high powers. However, it imposes a heavy strain on the diesel engine if not perfectly adapted to it.

« Hydraulic transmission has not yet proved its value above 150 H.P. approximately, but much may be hoped for from the three 1 200-H.P. triplet rakes of the Reichsbahn which are to be fitted with hydraulic transmission.

« The hydraulic transmission has the additional advantage of providing supplementary braking power. »

« VI. Railcar bogies are generally lighter than those used on ordinary rolling stock. They are fitted with double suspension in some cases, and single in others.

« To prevent hunting at high speeds, many railways are fitting shock absorbers, so far with satisfactory results. Others have improved the riding by reducing the conicity of the tyres.

« The engine is usually carried on the bogie. Experience, however, has shown that the passengers can be made practically as comfortable when the engine is located in the body as when it is carried on the bogie. »

« VII. Drum brakes of the automobile type are satisfactory on light railcars. On heavy railcars, the brake with blocks acting on the tyres or drums, with or without automatic regulation of the pressure in terms of the speed, is more generally used. The electromagnetic brake remains an interesting proposition, at least as a standby brake, in spite of the drawbacks found in service. »

« VIII. The use of special metals (aluminium, high-tensile steels, such as « Stainless », and special steels, such as « Corten ») has not resulted in such large weight savings as would be expected from the relative specific weights or tensile strengths.

« Most railways therefore still prefer carbon steel; some railways, however, use special steels in new stock to strengthen the body against shock, in addition to lightening it to some extent. »

« IX. Bogie railcars are used even on secondary lines for comfort and steadiness at high speeds, in place of four-wheeled railcars which only survive in the case of very small units.

« As regards the bogies themselves, experience has shown that the combination of laminated and coiled springs, completed by a reasonable use of indiarubber, gives the greatest comfort.

« Up to the present time, any additional « comfort due to the use of elastic wheels « is not in proportion to the additional « maintenance cost involved.

« The suppression of noise is at least « of equal importance for comfort.

« Ventilation is also a matter of great « moment. Some Companies have gone « so far as to consider air conditioning « throughout the year, in order to give « the greatest possible comfort. »

« X. There is a tendency in all coun- « tries to increase the capacity of rail- « cars with a desire to be able to vary « the capacity according to traffic requi- « rements. Many companies are conse- « quently now using either multiple-unit « sets, or cars coupled together or to « trailers.

« In multiple units, articulated bogies « are generally used and give the maxi- « mum of comfort and steadiness. The « use of ordinary bogies in place of arti- « culated bogies, however, enables the set « to be made longer and overcomes the « difficulties encountered when taking « out articulated bogies for repairs or « as the result of some incident or « other. »

« XI. In view of the valuable conclu- « sions come to in several countries « through using the Ferrand-Rousselet « method of calculating the characteristic « constants of railcars, this method « should be used by the largest possible « number of railways to enable them to « compare their modern railcars. »

« XII. Experience shows that the « essential factors in railcar costs are « the maintenance costs and the amorti- « zation charges. All companies are en- « deavouring to reduce their maintenance « costs at the present time, even if it « means some increase in fuel costs.

« In connection with the amortization « charges, any special fixed equipment « which may be necessary has to be ta- « ken into account; savings can be effec- « ted by improving the conditions under « which railcars are operated, and by « the training and specialisation of the « staff.

« In many countries, the cost of the « railcar-mile with many types of rail- « cars is considered at the present time « to be one half or even one third that « of the steam trains previously working « the same service.

« This last finding shows the great « value of railcars and the desirability « of dealing with the question again at « the next Congress, with special atten- « tion to the three points in connection « with which progress might be made « in the near future, namely : transmis- « sions and brakes, comparative test « methods, detailed investigation into « costs and the methods by which they « may be reduced. »

QUESTION II :

« The World Crisis and Railways

and the effects of the crisis on railway working; measures taken to lessen the effects of the crisis ; etc. »

« Great efforts have been made by the « railways to meet the difficulties result- « ing from the world crisis. Some slight « improvement in the economic situation « is now observable, although it is not « general and possibly is only tempo- « rary. The railways are particularly sen- « sitive to the effects of the crisis and « of competition, because of the regula- « tions and requirements imposed upon « them as public services.

« The position of the railways is still « imperilled by free or little regulated « road competition, which is harmful to « trade and industry, and the public « well-being.

« The burdens laid on the railways « must be lightened, and the legal re- « quirements imposed on them made « more flexible.

« It is absolutely essential that road « transport be subjected to such regula- « tions as will result in reasonable equa- « lity between the two methods of trans- « port, having regard to their technical « differences and the national inte- « rests. »

[385. (06. 111]

OFFICIAL INFORMATION

ISSUED BY THE

PERMANENT COMMISSION

OF THE

International Railway Congress Association

Meetings held by the Permanent Commission in Brussels (4-6 July, 1935).

On the 4th, 5th and 6th July 1935, the Permanent Commission of the Association held, in Brussels, Meetings which were attended, not only by most of its Members, but also by a number of engineers, specialists, and high officials of the main European Railways, who were specially invited to take part in the discussions relating to the investigation into two questions of prime importance for the railways : *Rail motor cars from the point of view of their construction,* and *The World crisis and its effects upon railway operation.*

These Meetings were of exceptional importance, because the International Railway Congress Association commemorated, in 1935, the fiftieth anniversary of its foundation. On this occasion, receptions also attended by the ladies, were organised in honour of the Delegates.

The list on pages 1181-1182 of this *Bulletin* gives the names of all the Members of the Permanent Commission and their assistants, who attended the Meetings.

The first Meeting was one held by the Permanent Commission in the Conference Room at the Headquarters of the Belgian National Railways Company, rue de Louvain, Brussels. A short account of this Meeting, presided over by Mr. Rulot, General Manager of the Belgian National Railways, is given hereafter.

Mr. Le Besnerais, Directeur de l'Exploitation, Chemin de fer du Nord, France, was elected Vice-President of the Executive Committee, in place of Mr. Colson, who has retired recently.

The latter was made an honorary member of the Permanent Commission, in recognition of his eminent services to the Association during his tenure (35 years).

Mr. Boutet, Directeur Général des Chemins de fer et des Routes au Ministère des Travaux Publics, France, was elected member of the Executive Committee.

Finally, the following Gentlemen were elected members of the Permanent Commission :

Mr. Ruffi de Pontevès, Directeur du Contrôle du Travail des Agents du Chemin de fer au Ministère des Travaux Publics, France;

Mr. Scoureff, Directeur Général Adjoint des Chemins de fer, Bulgaria;

Mr. Pelley, President, Association of American Railroads;

Mr. Lemaire, Directeur du Service de la Voie, Société Nationale des Chemins de fer belges, Belgium;

who take the place of members who resigned.

The Meeting approved the statement of receipts and expenditure for the year 1934 and the provisional budget for 1935, and fixed the variable part of the yearly contribution of the affiliated Administrations at 0.10 gold-franc per kilometre of line worked, the maximum laid down by the rules being 0.20 gold-franc.

The Permanent Commission then examined the proposals submitted by the Executive Committee in connection with the organisation of the 13th Session.

The decision was taken to hold this Session in Paris, in May-June 1937, in order to make it coincide with the International Exhibition which will be held in Paris at that time.

The list of questions to be placed on the Agenda of the 13th Session was discussed and definitely drawn up. This list will be found in this Bulletin (pages 1183-1184).

Then followed a preliminary examination of the proposals received by the Permanent Commission in respect of the Reporters who will be entrusted with the task of drawing up reports en each of the proposed questions.

The Meeting then made up as follows the Bureau of the technical meetings which were to be held on the 4-5 and 6 July :

1st SECTION :

Rail motor cars from the point of view of their construction.

President : Mr. Le Besnerais.

Vice-Presidents : Mr. Velani. Mr. Dorpmüller.

Principal Secretary : Mr. Chantrell.

Secretaries : Mr. Bulleid. Mr. Hennig.

2nd SECTION :

The World Crisis and Railways.

President : Sir Ralph Wedgwood.

Vice-Presidents : Mr. Koller. Mr. Marguerat.

Principal Secretary : Mr. Minsart.

Secretaries : Mr. Newbold. Mr. Despret.

Finally, the Members of the Permanent Commission were made aware of the changes which occurred in the membership of the Association. This is mainly a question of the resignation of a few Administrations with a low mileage, which have been either wound up, or amalgamated with other Companies, as shown hereafter :

Resignations.

	Km.	*Miles.*
Zuid Nederlandsche Spoor en Tramweg Maatschappij .	100	62
Central Apennines Railway (wound up, 5th May 1934)	135	84
Chemins de fer de Ceinture de Paris (divided up between the State, Est and Nord Systems)	179	111
Ch. de fer de Smyrne à Cassaba et prolongements (taken over by the Turkish State Railways) . . .	701	436
London Midland & Scottish Railway, Northern Counties Committee (included in L. M. S. R., England) .	336	209
Colombia Railways & Navigation Company (Receipts fallen below 2 000 000 gold-francs)	106	66
Lombardy and Romagnes Tramways	125	77
Total . . .	1 682	1 045

The actual loss in mileage is therefore only 239.

On the other hand, the Meeting was made cognizant with the financial position of the Association as at the 2nd July 1935, as well as other matters of an administrative kind.

* * *

The technical Meetings took place at the Brussels Exhibition and started at 2.30 p.m. on the 4th July.

The respective sections made themselves acquainted with the accounts drawn up on the questions of *rail motor cars* and the *world crisis*, by the Special Reporters, and a résumé of the debates was printed the same evening.

On the following day, 5th July, the work was resumed and summaries were proposed for submission to the Permanent Commission at the Plenary Meeting to be held on the 6th July.

In the August 1935 number of the *Bulletin*, a short account of the discussions on *rail motor cars* was reproduced; those relating to the *World crisis* are given in this issue.

The Plenary Meeting took place in rooms kindly put at the disposal of the Association by the University of Brussels. All the members of the Permanent Commission and their assistants who had come to Belgium to attend the discussions were present.

Under the Presidency of Mr. Rulot, the Meeting examined and discussed the summaries presented by the Bureau of each of the Sections, and final wordings were drawn up and unanimously approved. These summaries are given on pages 1173 to 1176 of this Bulletin.

Finally, the list of questions to be debated at the Paris Congress, in 1937, was examined and approved by the Meeting, as well as the names of the Reporters appointed for each subject.

* * *

On July 4th, the Belgian Government invited the Members of the Permanent Commission and the ladies accompanying them, to a formal dinner presided over by the Minister of Transport.

In the opening address, the Minister welcomed the guests, praised the work of the Association and expressed his best wishes to the Association on the occasion of the fiftieth anniversary of its foundation.

Mr. Le Besnerais, Directeur de l'Exploitation, French Nord Railway, on behalf of the foreign guests, made a much applauded speech to thank the representative of the Belgian Government.

On July 5th, the Delegates went to the Brussels Town Hall, where they spent a pleasant hour going through the main rooms of that noteworthy building and admiring the ancient pictures and famous tapestries which adorn its walls.

On the same evening, the delegates and ladies gathered again at a dinner given at the Egmont Palace, and presided over by Mr. Rulot, President of the Permanent Commission, and General Manager of the Belgian National Railways Company.

A number of personalities favoured this dinner with their presence, amongst whom the Belgian Minister of Transport, several former Belgian Ministers of Railways, Burgomaster Max, Minister of State, as well as many other eminent guests.

Speeches were made by Mr. Rulot, President, Mr. Spaak, Minister of Transport and Lord Rockley, Director of the Southern Railway, Great Britain, and Senior Member of the Executive Committee.

The gathering, enhanced by the presence of many ladies, was very lively and most cordial.

Finally, on July 7th, a trip from Antwerp to Ostend on the new. M. S. « Prince Baudouin » of the Ostend-Dover Line (Belgian State) was organised in honour of the Delegates and Ladies.

The departure was from the Nord Station, Brussels, by a special electric train; before going aboard, the guests were driven in motor cars through the main thoroughfares of the commercial metropolis, and also crossed the tunnel under the Scheldt, opened lately.

During the passage from Antwerp to Ostend, the excursionists were able to appreciate the sailing qualities of the mailboat « Prince Baudouin » and the perfection of its equipment and accomodation.

The day ended by a reception at Ostend and a concert at the Kursaal, and finally a train, hauled by one of the new *Pacific* locomotives of the Belgian National Railways Company, took the excursionists back to Brussels in 77 minutes.

ist of Members and their Assistants, who attended the Meetings.

* Members of the Permanent Commission.
* Assistants to Members of the Permanent Commission.

Bauer, directeur des Chemins de fer d'Alsace et de Lorraine (France).

Besser, Ministerialrat, Reichsverkehrsministerium (Germany).

Boutet, conseiller d'Etat, directeur général des Chemins de fer et des Routes, Ministère des Travaux Publics (France).

** **Michel**, ingénieur-adjoint, Ministère des Travaux Publics (France).

** **Robert**, ingénieur-adjoint, Ministère des Travaux Publics (France).

Bovee, General European Agent, Pennsylvania Railroad. (In place of Mr. **Atterbury**).

Castiau, secrétaire général au Ministère des Transports (Belgium).

** **De Droog**, directeur général au Ministère des Transports (Belgium).

** **De Walque**, ingénieur en chef, directeur d'Administration au Ministère des Transports (Belgium).

da Costa Couvreur, ingénieur, inspecteur au Ministère des Travaux Publics et des Communications (Portugal).

** **Soarès**, ingénieur, chef de la Division de l'Exploitation, Direction Générale des Chemins de fer (Portugal).

** **Ramalho**, ingénieur (Portuguese State).

Dautry (*prevented*).

** **Nicolet**, sous-chef au Service du Matériel et de la Traction des Chemins de fer de l'Etat (France).

Dorpmüller, Generaldirektor, Deutsche Reichsbahn Gesellschaft (Germany).

** **Stroebe**, Reichsbahndirektor, Deutsche Reichsbahngesellschaft (Germany).

Fiori, ingénieur, administrateur aux Chemins de fer de l'Etat (Italy).

** **Belmonte**, chef de service au Service Commercial et du Trafic des Chemins de fer de l'Etat (Italy).

** **De Corne**, inspecteur en chef au Service Commercial et du Trafic des Chemins de fer de l'Etat (Italy).

Ghilain, ingénieur en chef à la Société Nationale des Chemins de fer belges, Belgium (General Secretary, International Railway Congress Association).

** **Hennig**, ingénieur principal au Service du Matériel de la Société Nationale des Chemins de fer belges (Belgium).

Gresley, chief mechanical engineer, London & North Eastern Railway.

** **Bulleid**, assistant chief mechanical engineer, London & North Eastern Railway.

** **Gibson**, continental traffic manager, London & North Eastern Railway.

* **Gufflet** (*prevented*).

** **Dreyfus**, sous-chef de l'Exploitation à la Compagnie du Réseau Paris-Orléans-Midi (France).

* **Henry-Gréard**, directeur de la Compagnie du Chemin de fer de Paris à Orléans (France).

** **de Boysson**, sous-directeur de la Compagnie du chemin de fer de Paris à Orléans (France).

* **Hunziker**, ingénieur, directeur de la Division des Chemins de fer du Département fédéral des Postes et des Chemins de fer (Switzerland).

** **Kunz**, avocat, chef de section à l'Office Fédéral des Transports (Switzerland).

* **Jacobs**, directeur général de la Société Nationale des Chemins de fer Vicinaux belges (Belgium).

* **Jadot**, directeur du Service des Finances de la Société Nationale des Chemins de fer belges (Belgium).

* **Jezierski**, conseiller ministériel au Ministère des Communications (Poland).

** **Wagner**, ingénieur, chef de division au Ministère des Communications (Poland).

* **Kawai**, manager of the Berlin Office of the Japanese Government Railways.

* **Knutzen**, directeur général des Chemins de fer de l'Etat (Denmark).

** **Terkelsen**, directeur en chef du Personnel et de la Comptabilité des Chemins de fer de l'Etat (Denmark).

** **Munck**, chef de la Traction aux Chemins de fer de l'Etat (Denmark).

* **Kejr** (*prevented*).

** **Koller**, ingénieur, chef de section au Ministère des Chemins de fer (Czechoslovakia).

** **Leiner**, ingénieur, commissaire principal au Ministère des Chemins de fer (Czechoslovakia).

** **Nosek**, ingénieur, conseiller ministériel, chef du Cabinet du Ministre des Chemins de fer (Czechoslovakia).

* **Lamalle**, directeur général adjoint, directeur du Service de l'Exploitation à la Société Nationale des Chemins de fer belges (Belgium).

** **Henning**, inspecteur en chef, adjoint au directeur de l'Exploitation de la Société Nationale des Chemins de fer belges (Belgium).

** **Dessent**, ingénieur en chef à la Société Nationale des Chemins de fer belges (Belgium).

* **Le Besnerais**, directeur de l'Exploitation de la Compagnie du Chemin de fer du Nord (France).

** **Lamarque**, ingénieur en chef adjoint, attaché au Service Central de l'Exploitation de la Compagnie du Chemin de fer du Nord (France).

** **Chatel**, ingénieur principal adjoint au Service Central des ateliers de machines de la Compagnie du Chemin de fer du Nord (France).

* **Lemaire**, directeur du Service de la Voie à la Société Nationale des Chemins de fer belges (Belgium).

* **Mange**, administrateur de la Compagnie du Chemin de fer de Paris à Orléans, président du Comité de Gérance de l'Union internationale des Chemins de fer (France).

* **Marguerat**, directeur des Compagnies de Chemins de fer de Viège à Zermatt, Furka-Oberalp, Gornergrat et Schöllenen (Switzerland).

* **Mereutza**, directeur général des Chemins de fer de l'Etat (Rumania).

** **Bals**, directeur central des Chemins de fer de l'Etat (Rumania).

* **Moreno-Ossorio**, administrateur à la Commission Permanente du Comité exécutif des Chemins de fer du Nord de l'Espagne (Spain).

** **Viani**, ingénieur en chef du Matériel et de la Traction de la Compagnie des Chemins de fer du Nord de l'Espagne (Spain).

* **Mugniot**, directeur général de la Compagnie des Chemins de fer de Paris à Lyon et à la Méditerranée (France).

** **Boyaux**, ingénieur en chef adjoint de l'Exploitation des Chemins de fer de Paris à Lyon et à la Méditerranée (France).

** **Japiot**, ingénieur en chef adjoint du Matériel et de la Traction des Chemins de fer de Paris à Lyon et à la Méditerranée (France).

* **Philippe** (*prevented*).

** **de Spirlet**, ingénieur principal, adjoint à l'inspecteur général des lignes Nord-Belges (Belgium).

* **Rauscher**, conseiller ministériel, directeur commercial des Chemins de fer Fédéraux (Austria).

* **Lord Rockley**, director, Southern Railway (Great Britain).

* **Rulot**, directeur général de la Société Nationale des Chemins de fer belges (Belgium), president of the International Railway Congress Association.

** **Nachtergaele**, ingénieur principal à la Direction Générale de la Société Nationale des Chemins de fer belges (Belgium).

* **Schrafl** (*prevented*).

** **Muller**, ingénieur en chef de la Traction et des Ateliers des Chemins de fer Fédéraux (Switzerland).

* **de Senn**, secrétaire d'Etat, président de la Direction des Chemins de fer royaux de l'Etat (Hungary).

* **Swallow**, advisory engineer, Office of the High Commissioner for the Union of South Africa.

* **Valenciano y Mazeres**, inspecteur général des Ponts et Chaussées, administrateur de la Compagnie des Chemins de fer de Madrid à Saragosse et à Alicante (Spain).

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** **Cuttica**, inspecteur en chef, Service du Matériel et de la Traction des Chemins de fer de l'Etat (Italy).

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** **Fairburn**, chief electrical engineer, London Midland & Scottish Railway.

** **Stanier**, chief mechanical engineer, London Midland & Scottish Railway.

* **Wang**, representative of the Chinese Ministry of Railways.

* **Sir Ralph Wedgwood**, chief general manager, London & North Eastern Railway.

REPORTERS.

Cottier, secrétaire général des Chemins de fer Fédéraux (Switzerland).

Ashton Davies, chief commercial manager, London Midland & Scottish Railway.

Dumas, ingénieur en chef adjoint du Matériel de la Traction de la Compagnie du Chemin de fer du Nord (France).

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Lévy, chef adjoint du Service du Matériel et de la Traction des Chemins de fer de l'Etat (France).

von Beck, Reichsbahndirektor, Deutsche Reichsbahn Gesellschaft (Germany).

List of questions selected for the Agenda of the 13th Session (Paris, 1937).

1st Section: WAY AND WORKS.

I. — The construction of modern track to carry heavy loads at high speeds, and methods of modernising old track for such loads and speeds.

Facing points which can be taken at high speeds.

II. — Use of welding :

1. to obtain extra-long rails;

2. in manufacturing and repairing points and crossings.

a) Results obtained by using extra-long rails.

Methods used to ensure safe expansion of the rails and anchoring of the track.

b) Technical and financial results shown by welding points and crossings.

III. — Methodical and periodical maintenance of :

1. metal bridges;

2. signals;

3. metal supports carrying the contact wire on electric railways.

Organisation. — Working methods. — Materials used.

2nd Section: LOCOMOTIVES AND ROLLING STOCK.

IV. — Evolution of the rail motor car as regards its construction, and special investigation into the transmission and brake questions.

Comparative methods of testing railcars.

Detailed investigation into the costs of railcars and the methods of reducing them.

V. — Recent improvements in steam locomotives of the usual type and tests of new designs (high-pressure reciprocating locomotives and turbine locomotives) as regards construction, quality of materials used, efficiency, working conditions, maintenance and financial results.

Testing locomotives at locomotive experimental stations, and in service with dynamometer cars and brake locomotives.

VI. — Methods and devices used, in connection with electric traction, to save current between the supply side of the power station and the driving wheels (feeders, substations, tractors), and in particular the use of mercury rectifiers.

3rd Section: WORKING.

VII. — Economical operation of the main line systems' secondary lines.

Various methods adopted to adjust the operating facilities, safety measures, and station organisation to the volume of traffic.

VIII. — Application of rational organisation (planning) to the transport of goods, especially in connection with :

1. the functions and internal working of shunting yards;

2. the provision of inter-yard connections;

3. the estimation of the probable traffic to be dealt with, and the provision of the trains required;

4. the information to be given to the counsignees;

5. the acceleration of the turn-round of empty stock;

6. the use of containers and rail-road wagons.

IX. — Results obtained from the automatic and distant operation of signals and points, and from locomotive cab signals.

4th Section : GENERAL.

X. — Effets of the world crisis and road competition on the railway position. Corresponding changes in railway commercial policy.

XI. — Selection, orientation, and instruction of railway staff.

5th Section : LIGHT RAILWAYS AND COLONIAL RAILWAYS.

XII. — Co-ordination of operation as between main-line and light railways.

XIII. — Specifications for the fixed plant of railways with light traffic, intended to prevent the use of unnecessarily expensive track equipment, and generally to give economical working.

[621.392 & 665.882]

Experimental determination of the shrinkage stresses in butt-welded joints,

by Dr. Ing. G. BIERETT, Berlin-Dahlem,

Communication from the State Materials Testing Station, Berlin-Dahlem. Sequel to a lecture given at a meeting of the Special Committee on Welding Technique of the « Verein Deutscher Ingenieure », at Dusseldorf, on the 27th February 1934.

(V. D. I. Zeitschrift des Vereines Deutscher Ingenieure.)

The desire to complete the still rare data available on shrinkage stresses arising during welding led to the tests described hereafter. These tests are to be considered as an introduction to certain further investigations to be made into the relationship between the skrinkage stresses and the conditions under which the welding is done. The work so far undertaken has been started and will be completed in collaboration with the Special Committee on Welding Technique of the Verein Deutscher Ingenieure.

The attempts made to determine the shrinkage stresses in terms of the deformation have given very indifferent results so far. The idea in the present tests therefore is to ascertain the shrinkage stresses without taking the deformation into account.

From the user's point of view, the shrinkage itself may be a secondary matter; the shrinkage stresses are what matters as they directly affect safety.

The investigations are chiefly into butt-welded joints or lateral joints with continuous seams, because these are the two methods of assembly which enable us to build up welded structures. In the case of the lateral or frontal welds the question of form is so very important that, in our opinion, investigations of a general scope into the true shrinkage stresses in them would be useless. Contrariwise, it might perhaps be useful to have some information on the heat stresses in welds with added metal.

Conditions controlling the stresses in the butt weld.

When studying end to end (butt) welds, two cases arise : that in which, during the welding, the parts to be joined can follow the process of contraction without outside restraint, and that in which the parts are hindered in their deformation. In the first case, *simple shrinkage* stresses alone are set up, i. e. stresses arising during cooling down through the *inside* reaction of the parts against the contraction of the heated areas. If anything hinders the deformation, other stresses are set up by the *outside* resistance. For shortness, these will be called *reaction stresses* throughout this article. It should be noted that frequently, in practice, as for example when welding in a patch, no well defined distinction can be made between stresses set up by interior reaction and by exterior reaction. This distinction is nonetheless of value in the case of the simple butt-welded joints we are dealing with.

If we consider a welded plate held at the ends (figs. 1 to 4), the only stresses set up at right angles to the weld are reaction stresses, in a parallel section a-b (fig. 1) well away from the joint. They are here the only contraction stresses (fig. 2). We can suppose a linear limitation of the area of the reaction stresses at a sufficiently great

distance from the joint and the end. Generally, however, the zone of the stresses is not rectangular, owing to the action of the successive layers of added metal. The stresses at the joint and close to it (fig. 1, section *c-d*) acting at right

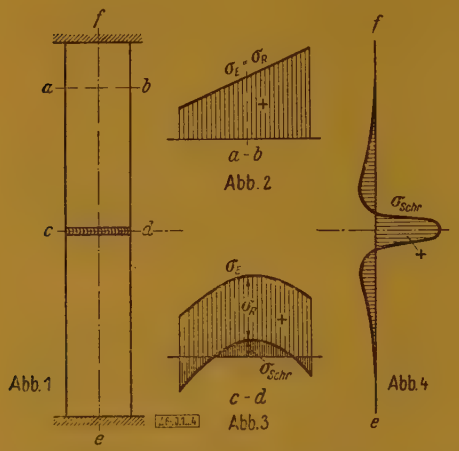


Fig. 1. — Plate built in at both ends. *a-b* = section parallel to the joint *c-d*; *e-f* = section through the middle.

Fig. 2. — Stress area for the section *a-b*; σE = contraction stress; σR = reaction stress (stress at right angles to the joint).

Fig. 3. — Stress area for the section *c-d*. $\sigma schr$ = shrinkage stress (stress at right angles to the joint).

Fig. 4. — Area of shrinkage stress, parallel to the joint for the section *e-f*.

Figs. 1 to 4. — Stresses in a plate welded with the ends fastened.

angles to the joint, are composed of shrinkage and reaction stresses (fig. 3).

The two zones of stresses must therefore have the same area. When the piece is cut along *a-b*, the reaction stresses also disappear at *c-d*. The simple shrinkage stresses remain. The area of the shrinkage stresses should be zero and these stresses distributed in such manner as to set up no twisting moment.

In the direction of the seam, all the stresses are as a rule purely shrinkage stresses, unless there should be outside restraining forces (fig. 4). From this point of view, all the longitudinal stresses in a girder, the web and flanges of which are welded, are shrinkage stresses, and this also applies to stresses occurring well away from the joints in the web.

The following, amongst other questions, are very important :

Do the shrinkage stresses at right angles to the welding seam largely depend, as regards their distribution and their magnitude, on the way the pieces are fixed (built in) at their ends, or is the way the ends of the joint are fixed reflected in reaction stresses? What is the position as regards arc welding and gas welding? What is the influence of the direction of the welding process, the welding metal added, the spacings of the weld roots (inner edges) and the other factors left to the welder's care?

Tests on butt-welded joints.

Test pieces and welding conditions.

To clear up these questions, we carried out a series of tests, some with the ends fixed, others free to move. The parts were not fixed in an ordinary way but built in by using a special framework, which was necessary for getting the same conditions of fixing, and getting the same spacing of the edges.

Consequently, we always used test pieces (figs. 5 to 9) in which the plates to be welded were rigidly fastened to the frame. In the case of type 1 (fig. 5) the plates were cut (milled) out of a large plate (fig. 6). In the case of type 2 (fig. 7), the plates were welded at the ends to U bars (fig. 8) and fitted with slides (fig. 9). The V joint, making an angle of 60°, was closed last of all in the middle, and thus the two originally free ends of the plates were built in. The joint was 300 mm. (11 13/16 inches) long, and the plates 12 mm. (15/32 inch) thick. The plates of test

piece No. 1 rested on a foundation covered with asbestos, whilst the welded joint was supported on a copper bar. The conditions as regards cooling down therefore were not such as would set up welding stresses (1).

The difficulties of preparing the test piece and the cooling conditions which could not be maintained entirely uniform led us to use test piece No. 2, very easy to make as regards the parallelism of the welds, the uniform spacing of the inner edge, and the condition of the surface of the plates. The test pieces, kept horizontal whilst welding the butt joint, simply rested in U bars at the ends, with asbestos packing in between. The cooling, therefore, was by air only, so that in this respect very uniform conditions between the joint and the plate, and especially between all the test pieces, were obtained.

The tests of non-fixed plates were only made on the arrangement provided for test piece No. 2. Only one of the two plates was fastened to the U bars, the other being free to move on rollers running on small angles fastened to the U's. Thanks to this arrangement, the results obtained with fixed ends and free support can be compared directly.

The plates welded as for test piece No. 1 were made of No. II ship steel, and the others of St 37.12 steel. The plates were annealed before welding. The welding was done in the Wilhelmshaven Navy yard and in the Wittenberge repair shops of the Reichsbahn. The plates for the first test were supplied by the Wilhelmshaven yard and the St 37 steel and the U's by the Vereinigte Stahlwerke. We would like to thank them for their assistance and also the Special Committee on Welding of the *Verein Deutscher Ingenieure*, which supplied the means for carrying out the tests.

At first the tests were only in connection with electric arc welding of built-in test pieces, with different welding rods, running the welds in different ways and varying the spacing of the roots. Later on we made arc welding and gas welding tests on built-in and free test pieces, using rods of the same quality, same spacing of the roots, and running the welds in the same directions. Table 1 gives particulars of the welding done.

All the joints of the electric welds were welded with direct current. The current intensity with plates II and IV was 120 amperes for the first layer and 140 amperes for the second and third, and in the case of plates VI and VIII, 120 amperes for the first, and 160 for the second

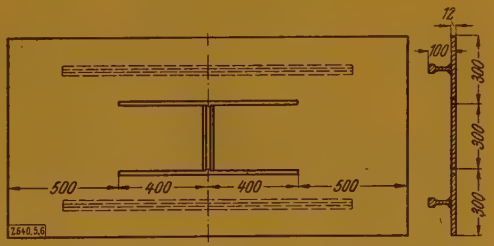


Fig. 5. — No. 1 type test piece. The plates to be welded have been machined out (by milling) of a large plate.

Fig. 6. — Cross section of No. 1 type test piece. The plate is stiffened by two rails welded on it.

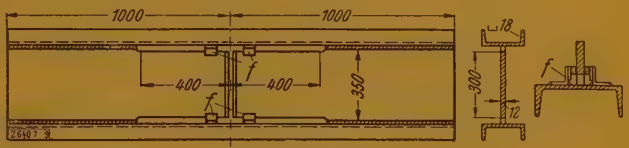


Fig. 7. — No. 2 type test piece. The plates are welded at the ends to U bars. f = guide.

Fig. 8. — Cross section of a No. 2 type test piece.

Fig. 9. — Guide f with rollers, for uniform guiding of the plates.

Figs. 5 to 9. — Test pieces for the measurement of shrinkage stresses.

(1) H. Gering : *Schrumpfspannungen bei elektrisch geschweissten Stumpfnähten* (Shrinkage stresses in electrically butt-welded joints). Mitt. Forsch. Inst. Verein Stahlwerke, Dortmund, Vol. 3 (1903), issue no. 5.

and third. In the case of plate V, welded with coated rod, the current intensity was 130 amperes in all three layers. Gas welding was done with oxy-acetylene, with neutral flame and without subsequent hammering of the joint.

Owing to the large size of the plates, the mass run down by fusion could not be ascertained with sufficient accuracy. We had to be satisfied with finding the mass run down on each plate. Generally speaking, we succeeded in keeping

Table 1. — Welds made on test pieces.

Type of test piece.	No. of plate.	Welding method.	Exterior conditions.	Welding rod.	Spacing of roots.	Direction of welding	Remarks.
1	II	Arc welding.	Built in.	Coated rod.	5/64″	→	Arc welding.
	III					←o→	
	IV				5/32″	→	
	V			Coated at end.	5/64″		
2	VI			E 34	1/8″	→	3 layers.
	VII	Gas welding (to the right).		G 34			1/8″ and 5/32″ diameter.
	VIII	Arc welding.	Free.	E 34			Autogenous gas welding 1 layer.
	IX	Gas welding (to the right).		G 34			15/64″ diameter.

the mass of melted metal more or less the same in plates with the same spacing of the runs. In the case of the plates free to move when being welded, the weight of the metal melted in some cases was some 10 % less than in the case of the test piece welded in the built-in condition, owing to shrinkage of the welded seam.

The welds shown in table 2 may be compared with one another.

Stress measurements.

The reaction stresses can be measured in the cross sections outside the heated areas, directly during the welding, by means of extensometers. By measuring some given lengths before and after welding, at different intervals in different sections at right angles to the joint, a qualitative conclusion can be arrived at.

Table 2. — Comparison of welds.

Comparison.	No. of plate.
Electric arc welding, and autogenous gas welding	VI and VII VIII » IX
Built-in test pieces, and test pieces with free ends	VI » VIII VII » IX
Different directions of welding process	II » III
Various spacings of roots (inner edges)	II » IV
Various welding rods	II » V

Figures 10 and 11 show the actual stresses found in the case of one plate welded in the built-in condition. The elongations were ascertained, before and after welding, by measuring three marker lines along the edges and on the centre line. The deformations were measured at different distances from the joint on a uniform length of 100 mm. (3 15/16 inches), with an extensometer (2) which enabled, under the best conditions, deformations to be measured within ± 0.001 mm. (0.000039 inch) corresponding to a stress of ± 0.2 kgr./mm² (0.137 Engl. ton per sq. inch) in a measured length of 100 mm. (3 15/16 inches). By means of these measurements, it is possible to ascertain that at the end of the joint last closed up, the stress is a very small tensile one if not even a compression one, that at the middle of the plate there was a heavy tensile stress, and at the beginning of the joint a compression stress.

At present, the shrinkage stresses can only be ascertained by operating on several zones of the joint in succession, i. e. dividing the plate by the reticular process, into a network of orthogonal parts, and measuring, before and after welding, the lengths taken along and across the joint, and also sometimes in other directions.

The X-ray method might also be resorted to, by measuring the distances between atom groups if, in the sum of the stresses thus obtained, it were possible to make a distinction in respect of the two main directions.

The shrinkage stresses have been ascertained by division of the plate, according to the first method described above. The lengths at right angles to, and parallel with, the joint were measured before and after, dividing the plate into a network, the measurements being made with an extensometer (2) built by the Materialprüfungsanstalt of Stuttgart. The marker length was 20 or 30 mm. (25/32 or 1 3/16 inches). The available instruments were accurate to ± 0.001 mm. (0.000039 inch), corresponding to a stress of ± 1 kgr. per mm² (0.635 Engl. ton per sq. inch) on a measured length of 20 mm. (25/32 inch).

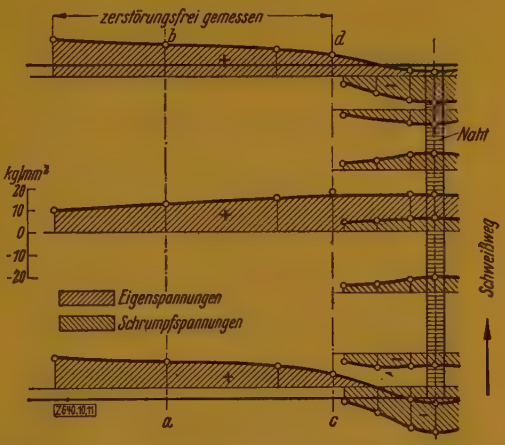


Fig. 10 (left). — Contraction stresses and shrinkage stresses, perpendicular to the joint.

Plate II. Arc welding. Coated rod, 3 and 4 mm. (1/8" and 5/32") diameter. 3 layers. No. 1 type test piece. *a-b* and *c-d* = measured cross sections.

Fig. 11 (right). — Contraction stresses in sections *a-b* and *c-d*, parallel to the joint.

Plate II. No. 1 type test piece.

Note. — Eigenspannungen = Contraction stresses. — Schrumpfspannungen = Shrinkage stresses. — Schweissweg = direction in which welded. — Naht = seam. — Zerstörungsfrei gemessen = measured without destruction.

Before completion of the operations, the back end of the plate was cut off; the reaction forces were thereby eliminated. The distribution of the reaction stresses immediately beside the joint was measured by means of extensometers. The combination of the shrinkage stresses with the reaction stresses enabled the curves of the contraction stresses to be drawn up to the joint.

(2) Manufactured by Messrs. Staeger, of Berlin-Steglitz.

The contraction stresses (fig. 11), in different sections parallel to the joint, are represented, at the joint and close to it, by curves. In the cross section *a-b* at 240 mm. (9 7/16 inches) from the joint [distance from the centre of the measured length of 100 mm. (3 15/16 inches)], the curve of the contraction stresses has a rectilinear aspect. Still further from the joint, close to the fixed end of the plate free to move laterally, the influence of the special fixing method shows itself in the greater original stresses at the edges and the lower stresses at the middle of the plate.

Figure 11 represents the average values of the stresses ascertained on the two sides of the plate, upper and root sides of weld. The stresses were measured on both sides of all the plates, and they generally differed on both sides of each plate. Very great differences were found not only in the case of the V joints we are considering, but also on the X joints investigated by E. Siebel and M. Pfender (3) Test piece No. 2, symmetrical about the middle plane of the plate, gave better results in this respect.

Figures 12 and 13 show, for one of the welded plates, using No. 1 type piece, the shrinkage stresses without the reaction stresses on the two sides of the plate, perpendicular and parallel to the joint. The great difference between the stresses on the two sides is clearly visible.

Below, for greater clearness, we only give the mean values of the stresses on the two sides.

Transverse stresses.

Figures 14 and 16 show the shrinkage stresses, the reaction stresses, and the contraction stresses for the first four plates electrically welded in the built-in condition, using the type I test piece.

The diagram representing the shrinkage stresses σ_{schr} (fig. 14) shows that the character of the curves is the same for plates II, IV and V, welded in the same direction from *G* to *A*. By its nature, the line representing plate III, welded from the middle towards the ends, was very different from the former ones. In all the plates, the compression stresses are very great at the edges, and approach the crushing limit immediately thereat.

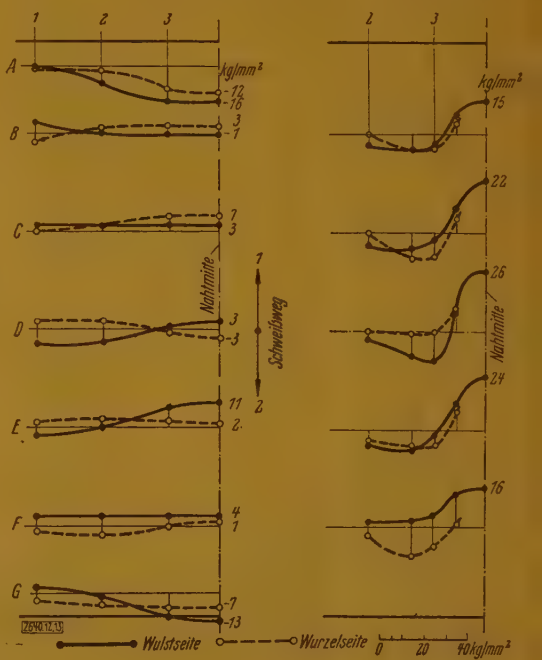


Fig. 12. — Shrinkage stresses at right angles to the joint.

Fig. 13. — Shrinkage stresses parallel to the joint.

Plate III. — Arc welding. Coated rod 3 and 4 mm. (1/8' and 5/32") diameter. Three layers. No. 1 type test piece. A to G = measuring lines perpendicular to the joint. 1 to 3 = measuring lines parallel to the joint.

Note : Wulstseite = upper flange side. — Wurzelseite = root side. — Nahtmitte = center line of seam.

(3) E. Siebel and M. Pfender, *Arch. Eisenhüttenwes.* vol. 7 (1933/34), page 407; see also E. Siebel, Z.V.D.I., General Meeting Berlin 1933, page 28.

The difference of the curve for plate III, welded in another direction, shows that the distribution of the transverse stresses largely depends upon the direction of welding and that, by ascertaining and using this dependence, after taking into account the forces supported in service, a means for improving the butt-welded joints may be gained.

The area of the *reaction stresses* σ_R (fig. 15) is in all cases trapezoidal in form. In the case of plates II, IV and V, the stresses are greater at the end *A* than at the beginning *G* of the joint. The average reaction stresses in plates II and III made with the same rods and the same spacing of the roots (inner edges), but welded in different directions, are the same (12.3 and 12.4 kgr. per mm² = 7.87 and 7.93 Engl. tons per sq. inch). The increase of 2 to 4 mm. (5/64 to 5/32 inch) (plate IV) in the spacing of the roots (inner edges) raises the average reaction stress to 15 kgr. per mm² (9.52 Engl. tons per sq. inch). Almost the same effect occurs when a coated rod is used to weld test piece V (14.7 kgr. per mm² = 9.50 Engl. tons per sq. inch).

The contraction stresses σ_E (fig. 16) composed of the shrinkage and reaction stresses are greatest for plate V welded with coated rod. In the plates welded continuously, a considerable compression stress is still set up in spite of the large average tension at the beginning of the joint. At the end of the joint, there are light compression or tensile stresses, and in plate III, welded from the middle, there are small tensile stresses at the ends of the joint.

In the case of plates VI and IX, of No. 2 test piece type, electrically and gas-welded, with the ends free or fixed, the same shrinkage stresses were found (figs. 17 to 22). In the case of plates welded in the built-in condition, the contraction stresses are free from reaction stresses, in this diagram. As regards the two methods of welding (fig. 17 — arc welding; fig. 20 — gas welding) the condition of the contraction stresses are, ignoring certain variations at the edges, the same for the plates welded in built-in, and in the free condition. The answer to the question, asked at the beginning, as to whether the conditions under which the test piece is built in (fixed) have any great influence on the shrinkage stresses, is in the negative. The conditions under which the piece is built-in evidently only show themselves in the reaction stresses.

The conclusion come to for the rest of the experimental work is that the observations on the plates welded when built-in can give a good idea of the conditions in plates welded in the free state. For this reason, too, after the state of the shrinkage stresses has been

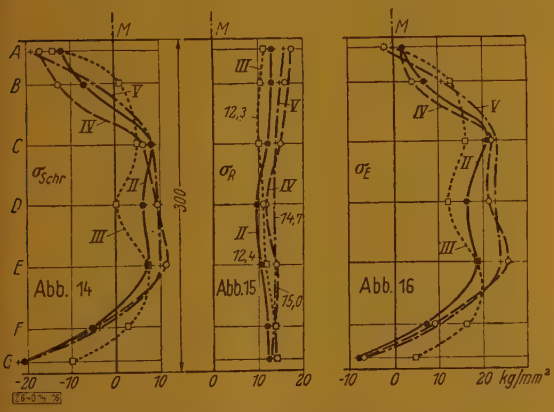


Fig. 14. — Shrinkage stresses σ_{schr} perpendicular to the joint, in the cross section through the joint of plates II to V. No. 1 test piece.

Plates II, IV and V were welded from G towards A, Plate III from D towards A and G. A to G = measuring lines perpendicular to the joint. M = middle of the joint.

Fig. 15. — Reaction stresses σ_R normal to the joint, in the cross sections through the joint of plates II to V of figure 14.

Fig. 16. — Contraction stresses σ_E normal to the joint in the cross sections through the joint of plates II to V of figure 14.

determined in the laboratory, for the different welding conditions, it will be possible to show approximately what happens at the joints in structural members, by measuring the contraction stresses near the joint.

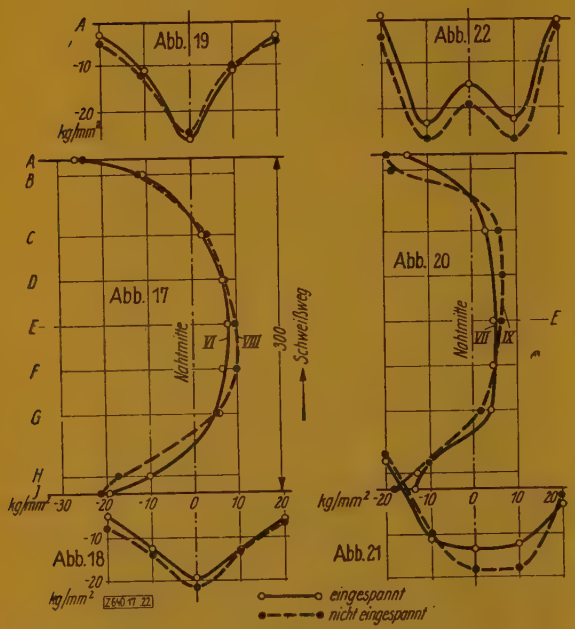


Fig. 17. — Arc welding.
Fig. 18 and 21. — Transverse stresses at the edge *J* of the plate.
Fig. 19 and 22. — Transverse stresses at the edge *A* of the plate.
Fig. 20. — Gas welding.

Figs. 17 to 22. — Shrinkage stresses normal to the joint of plates VI to IX. No. 2 test piece.

A to *J* = measuring lines.

Note : Abb. = figure. — Eingespannt = built in. — Nicht eingespannt = not built in.

The shrinkage stresses perpendicular to the joint were found, in the part subjected to tension, to be rather lower when gas-welded than when arc-welded. This also occurred at the edge in the compressed zone of the joint.

However, at the last end of the joint to be closed, *compression stresses* of the same magnitude as with arc welding were set up at the edges of the plate beside the joint (fig. 22). Consequently, the stress equalizing process still went on in the joint, which the less heated zones of the plate could not follow so quickly. The curves of figures 18, 19, 21 and 22 show the character of the *transverse stresses at the edges A* and *J* which show characteristic differences for the two methods of welding.

By investigating the condition of the shrinkage stresses, the reaction stresses and the contraction stresses for plates VI and VIII (figs. 23 to 25) electrically- or gas-welded with the ends fixed, in the gas weld, the shrinkage stresses are smaller and the reaction stresses rather greater. The result is that when welded under exterior restraint, the contraction stress conditions are almost the same by the two processes, except for the more marked divergences at the edges of the plates. The average reaction stress in the two methods is 14.2 and 17.2 kgr. per mm² (9.02 and 10.92 Engl. tons per sq. inch).

The differences between the spacing of the roots (inner edges) of plates II, VI and IV, electrically welded, spaced 2, 3 and 4 mm. (5/64, 1/8 and 5/32 inch) between the roots, have naturally produced also differences between the average reaction stresses which were 12.4, 14.2 and 15 kgr. per mm² (7.87, 9.02 and 9.52 Engl. tons per sq. inch). Plate VI was welded with bare rods, the two others with coated rods. The weight of added metal melted was 265, 300 and 235 gr. (0.58, 0.66 and 0.52 lb.).

Compression-shrinkage stresses. — In all the plates examined, compression-shrinkage stresses occurred at the ends of the joint. We will deal with this aspect of the matter rather more fully, as if the welder can vary at least the direction of the stresses at the edges, one important safety condition for butt-welded joints will be secured.

Assuming theoretically that the added metal is applied as one run and cools down uniformly, the stresses must have for internal equilibrium much the aspect shown on the figures, i. e. there must be transverse tension in the inside and compression on the outside. In practice, there may be set-offs as the added metal is applied in degrees and so cools off differently. The changes will increase with the time the weld takes to make and consequently, to mention but one factor, with the length of the joint.

In a joint 740 mm. (29 1/8 inches) long, electrically welded, and one 600 mm. (23 5/8 inches) long, gas welded, the plates being 28 to 30 mm. (1 7/64 to 1 3/16 inches) thick, SIEBEL and PFENDER [3] both found compression stresses at the ends of the joint.

Against this, in the case of another plate with a continuous electric weld 700 mm. (27 1/2 inches) long, there appeared to have been, in the direction at right angles to the joints, compression at the middle and tension at the edges. This complete reversal of the stresses, relatively to the small plates we examined ourselves, and also to the two other large test plates, is possibly due to the difference in time taken for the two plates as regards completing the joint, cooling, and the inception of the stresses.

In the small plates, our measurements revealed that, at the moment the joint was finished, the existing stresses were only a small part of the ultimate ones. Figure 26 shows the growth of the stresses during welding and cooling of plate VI electrically welded in a continuous manner in a cross section 240 mm. (9 7/16 inches) from the middle of the joint. It is true that, at the joint itself, the values of the stresses at the ends were quite out of step with those at the middle relatively to the conditions in the cross section; nonetheless here again we can imagine a corresponding development of the stresses in terms of the time,

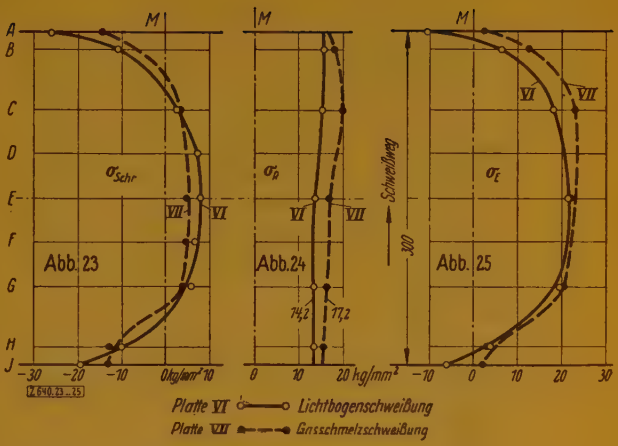


Fig. 23. — Shrinkage stresses normal to the centre line of the joint for plates VI arc welded, and VII gas welded.

A and *J* = edges of the plate. — *E* = centre line of the plate. — *M* = centre line of the joint. No. 2 test type piece, built in.

Fig. 24. — Reaction stresses normal to the joint, at the middle of the joint of the plates of figure 23.

Fig. 25. — Contraction stresses normal to the joint, at the middle of the joint of the plates of fig. 23.

Note : Lichtbogenschweissung = arc welding. — Gasschmelzschweissung = gas welding.

seeing that the average stress must be the same in all the cross sections.

In joints of some length and thickness, after the joints are finished, it is possible that, owing to the greater cooling there is a considerable internal reaction stress from the beginning of the joint relatively to the shrinkage at the ends of it, and that this reaction could have caused the change in direction of the stresses. The welding speed, therefore, in long joints is very important as regards the stresses set up.

Attention may be called to another phenonemon the figures relating to the transverse shrinkage stresses partly bring out. Generally speaking, the conditions for equilibrium are not entirely fulfilled; the compressed area is greater than that in tension. This fact is not

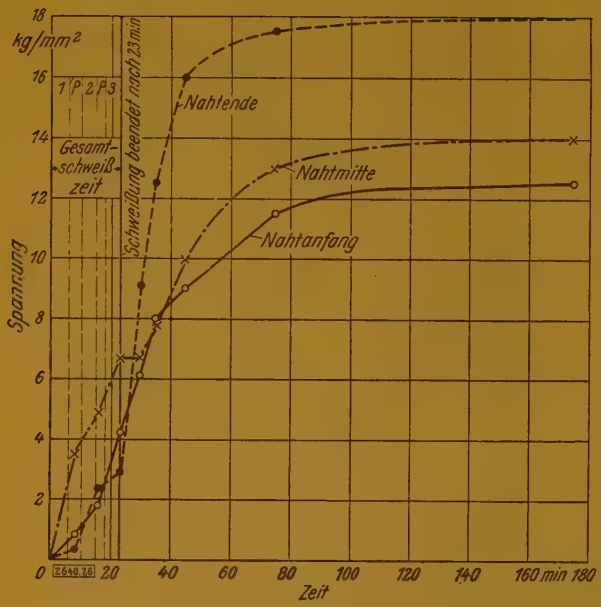


Fig. 26. — Development of the contraction stresses during and after electrically welding the plate No. VI.

Extensometer in the cross section 240 mm. (9 7/16") to one side of the joint.
1 = first layer; 2 = second layer; 3 = third layer; P = stop.

Explanation of German terms :

Spannung = stress. — Gesamtschweisszeit = total welding time. — Schweissung... nach 20 min. = welding stopped after 20 minutes. — Nahtende (-mittel -anfang) = end (middle-origin) of the joint. — Zeit = time. — Schweissung = welding.

imputable to wrong measurements, but may be ascribed to the stresses measured on the surfaces of the plate differing from the average stresses acting on the thickness of the plate and especially to the tensile stresses acting on the surface being weaker than the average tensile stresses acting on the thickness of the plate.

Longitudinal stresses.

We have dealt with the transverse stresses first because they are generally considered the most important ones as regards the strength of the butt-welded joints. Actually the transverse stresses and the longitudinal stresses are directly bound up with one another, and one kind cannot occur without the other.

In the hypothesis — not proved in practice — that there is only cross shrinkage, without longitudinal shrinkage, and in the second hypothesis that the added metal is applied in one stroke and cools uniformly, neither cross- nor longitudinal stresses are set up. In the opposite assumption of longitudinal shrinkage without cross shrinkage, both longitudinal and transverse shrinkage stresses would be set up. In no case is it conceivable, therefore, that there are transverse stresses when no longitudinal stresses are present.

In the graphs given below, the measured longitudinal shrinkage stresses are shown on the cross sections of the joint, at right angles to the direction in which they act. In plates II to V electrically welded, more or less equal stress curves are found (fig. 27). (The curve for plate II could not be completed because of a wrong measurement.)

The stresses approach the yield point (*Streckgrenze*) of the plate metal, but are appreciably below the yield point of the added metal. The conditions under which the weld is made have no noticeable effect on the maximum stress. As regards the necessary equilibrium be-

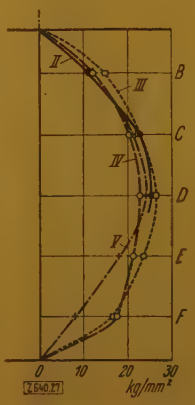


Fig. 27. — Longitudinal shrinkage stresses, shown above the cross section of the joint normal to the direction of their action.

Plates II to V electricically welded. — *B* to *F* = measuring lines.

tween the longitudinal and transverse stresses, this observation is not in contradiction with the conclusion given above, namely that the transverse stresses can be affected by the successive welding operations; actually, there may be changes in the transverse stresses which may in their turn involve changes in the longitudinal stresses, without the tensile stress in the joint undergoing any appreciable change.

The tests on the electrically welded plates VI and VIII (fig. 28) led to the same results. The maximum longitudinal stress was 23 kgr./mm² (14.60 Engl. tons per sq. inch) with a maximum elongation of the added metal of 29 and 30 kgr./mm² (28.57 and 19.05 Engl. tons per sq. inch). In the gas-welded plates (fig. 29), the longitudinal stresses are much smaller. The maximum longitudinal stresses are not found at the joint itself but near the joint (fig. 31), whereas when electrically welded the greatest stresses were in the joint (fig. 30).

Values of the elastic reaction stresses. — All the values of the elastic reactions determined by the separation of the stresses corresponded to stresses not higher than the yield point of the added metal. Had the deformations been greater, the stresses present before separation could not have been shown.

There may be stresses exceeding the yield point inside the joint if appreciable tensile stresses act at the same time in the two directions at right angles to this main direction. Such a set of stresses is naturally very easily affected by mechanical operations such as cutting, drilling, etc., as it is not to be expected that all the stresses will be reduced simultaneously.

Consequently cutting up may set up deformations of a plastic nature, and their separation from those of an elastic kind corresponding to the pre-existing stresses, is impossible. It is hardly possible, therefore, to ascertain by measurement methods involving mechanical operations the shrinkage stresses near the yield point, set up inside a joint. The best conclusions on the condition inside the joint for the stresses measured on the surface can be obtained from the relation between the longitudinal and transverse stresses, based on the internal equilibrium. This question will be investigated more completely in a subsequent note. Possibly too, in practice, the stresses on the surface are more important than the internal ones, as it is known by experience that incipient cracks and especially fractures start from the surface rather than from the inside.

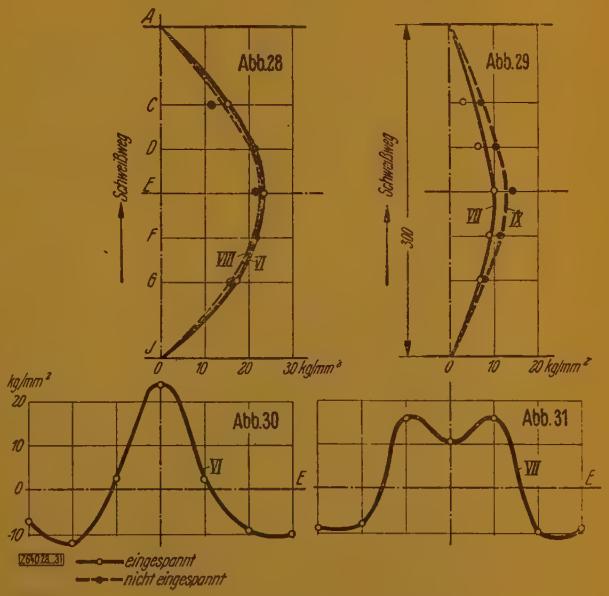


Fig. 28. — Longitudinal shrinkage stresses in plates VI and VIII. — Arc welded.

Fig. 29. — Longitudinal shrinkage stresses in plates VII and IX. — Gas welded.

Fig. 30. — Longitudinal shrinkage stresses in plate VI on the middle plane. — Arc welding.

Fig. 31. — Longitudinal shrinkage stresses in plate VII, along the middle plane. — Gas welded.

Reduction of shrinkage stresses by an additional strain (lowering the stresses).

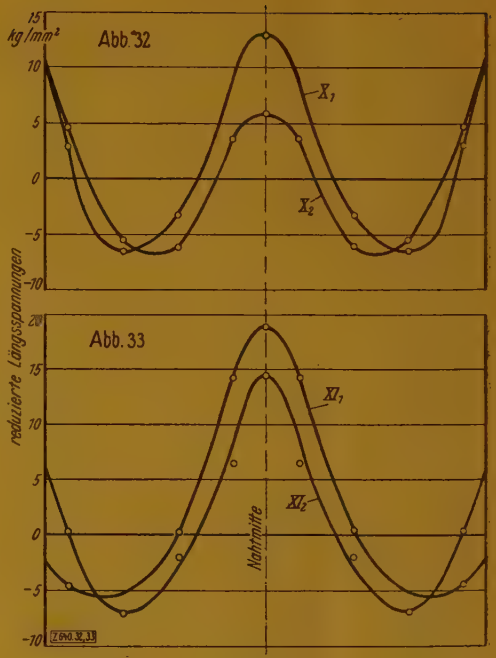
Seeing the magnitude of the stresses, one is led to wonder how the joints behave under an additional strain applied in the direction of the joint.

SIEBEL and PFENDER's experiments have shown that in a flat bar subjected to contraction stresses, when loaded externally, below the yield point of the material, but heavily enough to cause plastic deformation at the points of excessive stress, most of the deformation is undergone at the first application of the load; the major part of what is called the reduction of the stresses takes place at the same time.

In the following tests, on the reduction of the stresses, the test bars were subjected ten times to an external tensile load of 20 kgr./mm² (12.70 Engl. tons per sq. inch), in the direction of the joint, for the reason that assemblies stressed in service in the direction of the joint are mainly concerned in this question.

The tests were made on electrically welded plates, which, owing to the jaws of the test machine, was only 200 mm. (7 7/8 inches) wide, the length being 500 mm. (19 11/16 inches) and the thickness 12 mm. (15/32 inch) (figs. 32 and 33). Bare and coated rod was used. The bare rod when run down by fusion had an elastic limit of 20 to 30 kgr./mm² (12.70 to 19.05 Engl. tons per sq. inch), and a tensile strength of about 42 kgr./mm² (26.66 Engl. tons per sq. inch). The coated rod was not the correct kind for use with ST 37 steel, but was intended for a higher tensile steel. The maximum elastic limit and tensile strength of the fused metal were 55 and 60 kgr./mm² (34.92 and 38.09 Engl. tons per sq. inch). Naturally, such mechanical properties resulted in high contraction stresses.

Several identical plates were welded with each kind of rod under exactly the same conditions. The longitudinal



Figs. 32-33. — Reduction of the longitudinal shrinkage stresses by the application of an external load. — Arc welded.

Plates X_1 and XI_1 not loaded in advance. Plates X_2 and XI_2 loaded in advance by a tensile load of 20 kgr./mm² (12.70 Engl. tons per sq. inch).
Fig. 32. — Welded with bare rod.
Fig. 33. — Welded with coated rod.

Note : Reduzierte Längsspannungen = reduced longitudinal stresses. — Nahtmitte = middle of weld.

shrinkage stresses were found to be 20 kgr./mm² (12.70 Engl. tons per sq. inch) in a plate tested in the welded condition, and also in another previously subjected to 10 applications of the load. The contraction stresses in the not loaded state are much less, owing to the narrow width of the plate, than those measured previously, without this being in contradiction with the previous results.

In this series of tests, only deformations occurring in the direction of the joint were measured. The so-called re-

duced stresses corresponding to these deformations were calculated and entered over the width of the bar (The surfaces under tension need not meet the condition of equilibrium for the reduced stresses).

The remarkable thing is that this compensation of the stresses, only occurring, however, with a rather great additional load, can take place with very little elongation. The elongation in this case was only some 0.025 % (fig. 34).

The investigation into these effects is less interesting in the case of butt joints

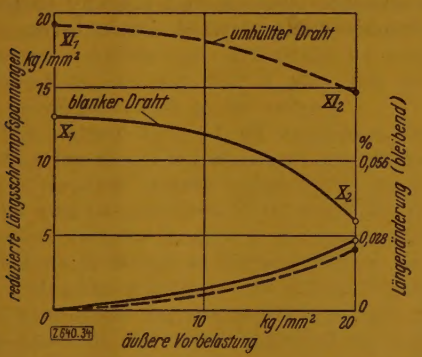


Fig. 34. — Reduction of the longitudinal shrinkage stresses by the application of an external load for plates X and XI of figures 32 and 33. — Arc welded.

Explanation of German terms :

Reduzierte Längsschrumpfspannungen = reduced longitudinal shrinkage stresses. — Umhüllter (blanker) Draht = coated (bare) rod. — Äussere Vorbelastung = Exterior pre-loading. — Längenänderung (bleibend) = change in length (permanent).

stressed transversely, than in that of butt joints with lateral seams stressed longitudinally alone or in addition. Any appreciable difference, as regards longitudinal shrinkage stresses, between butt-welded joints and those with lateral seams, cannot be ascertained.

DOERNEN's test (4) on welded girders have shown that the internal reaction stresses in the web were lower than in rolled sections. In the joints, however, he found stresses approaching the elastic limit.

(4) J. DOERNEN, Stahlbau, Vol. 6 (1933), page 22.

Summary.

According to the results obtained up to now it may be admitted that there always are, in electrically welded joints, made with the usual rods, heavy longitudinal stresses, and that in gas welded joints, the longitudinal stresses, though lower in value, still reach a considerable value.

These stresses are much less likely than transverse stresses to be eliminated or reduced by altering the welding methods used. Their reduction appears to be desirable at least when the joints have to stand in service an additional tensile load, as in girders and boilers. For this purpose, the mechanical properties of the added metal should be altered by a suitable change in the rods, so that the initial longitudinal stresses shall already be smaller and the compensation of the stresses shall begin at low stresses. A full heat treatment to remove the stresses is not necessary in most cases. It would perhaps prove useful, to ascertain whether the internal-reaction compression stresses, the maximum value of which is at some distance from the joints, could be reduced sufficiently by local heating with the welding burner.

The effects of the shrinkage-compression stresses parallel to the joints have not been found very dangerous in most cases. They can become serious in parts of a structure subjected to outside compression stresses.

Bulging which frequently occurs may be due to these stresses rather than to compression stresses at right angles to the joints. Their real importance as affecting the strength can only be ascertained by buckling and bending tests. The best and cheapest way of reducing the compression stresses is to see that the cross section of the added metal is

the smallest possible, that is to say, in longitudinal channel joints, to keep the stresses within allowable limits.

Though for reasons of equilibrium, the longitudinal and transverse stresses are directly related, in our present knowledge we must admit that the transverse stresses are much more dependent on the welder, and the welding process and conditions, than the longitudinal ones. When endeavouring to find out the law governing the shrinkage stresses, we should not only try to reduce the transverse stresses to a minimum, but also see if we can arrange matters so that the shrinkage stresses could be compensated by the working stresses. In parts under compression, for example, we should be careful to see that there were no shrinkage-compression stresses at the edges, but that these be subject to shrinkage; inversely we could take care in strained butt-welded joints to get a shrinkage compression at the ends of the joint in order to avoid the risk of a notch effect or eccentric loading action. Anyhow, the intelligent use of the shrinkage phenonema can be considered as an essential condition for safety, and possibly as providing for an increase in the permissible stresses, and thereby in the economic value of welded structures.

NEW BOOKS AND PUBLICATIONS.

[621. 43]

BRIAN REED. — **Diesel Locomotives and Railcars.** — One volume (5 1/5 × 8 3/4 inches), of 190 pages with 131 figures. — 1935, The Locomotive Publishing Company Ltd., 3, Amen Corner, London, E. C. 4. (Price : 6 sh. net).

The application of the diesel engine to railway traction has made rapid progress in recent years; it is still one of the most interesting of railway subjects, and is frequently discussed in valuable articles in the technical press. This documentation is, however, scattered over many different publications. The work Mr. BRIAN REED has recently published is a general exposition of the question, complete and up to date; it brings out facts and results proved in practice, which can definitely be considered as correct, but it also sets out the problems still to be solved.

The author first of all considers the claims for diesel traction and shows that these depend mainly upon local conditions and the services to be worked. He records certain incorrect or exaggerated opinions in favour of diesel traction, and he states the position very fairly, basing his arguments on the statistical data of the costs of operation supplied by railways for diesel and steam traction, both for train and shunting locomotives, and for railcars properly speaking.

The second chapter is devoted to the growth of diesel traction since it was first used in Sweden, in 1913, when the Atlas diesel-electric railcar was brought out, up to the powerful train locomotives and high-speed diesel-electric rakes which have been put into service in recent years, in Europe and the United States. The book deals more particularly with the work done in France, Germany, Great Britain, Denmark, the East, Canada, the United States, and South America.

The special features of diesel traction are the subject of the third chapter, in which the Author first of all deals with the relative value of the three principal kinds of transmission in use, a subject which he develops further on in special chapters. Other important points examined are those of the high speeds which can be reached with diesel traction, and the special brake arrangements needed. Three tables give the characteristics of the diesel-electric high-speed trains, railcars, and of diesel locomotives throughout the world, with interesting comments thereon.

The diesel traction engine is discussed in chapter IV, as regards weight, space occupied, the way it is fitted to the vehicles, fuel consumption, etc. In this chapter the question of supercharging, precombustion chambers, and the various methods of injection are dealt with. The author describes in particular the Maybach, Beardmore, Busch-Sulzer, Ganz, Frichs, and Ingersoll-Rand engines, and gives a table of the main characteristics of the principal engines in use.

Cooling, lubrication, starting, and the exhaust are dealt with in a short chapter; the principal systems of transmission are then investigated; the efficiency curves and the tractive effort curves in terms of the speed with direct drive, mechanical transmission, electric transmission, and hydraulic transmission, as well as the acceleration diagrams in various particular cases, are analysed.

The three principal transmission systems used are dealt with in a special chapter. Under mechanical transmission, the author studies the transmission of diesel locomotives, then of railcars with particular stress on the Maybach transmission, and the Winterthur transmission with hydraulic clutches; the Mylius speed box and those using epicyclic gears; hydraulic clutches properly speaking; free wheels; and distant control. The chapter on hydraulic transmission deals especially with the Voith-Sinclair and Lysholm-Smith transmissions. The chapter on electric transmis-

sion deals with the Lemp, R. Z. M., Brown-Boveri, Gebus, Oerlikon and the English system fitted to the L. M. S. R. shunting engines. The book ends with a short note on the resistance of diesel vehicles.

The publication of this particularly well-planned and documented book, which has been issued in a very convenient form, will be welcomed by the many engineers dealing at the present time with diesel traction, the progress of which continues to be followed with the closest attention by most railways.

A. C.

[351. 712. (.44)]

Recueil des Spécifications Techniques et Cahiers des Charges unifiés des Grands Réseaux de Chemins de fer français (*The French main-line railways' standard specifications. New edition, 1935*). — A collection bound in a loose-leaf holder. — 1935, Publisher : Dunod, 92, rue Bonaparte, Paris. (Price : 15 Franch francs. — The holder alone : 10 francs. — The separate specifications : 1, 2, 3, 6, 12, 14, and 24 francs.)

The standard specifications for metal and other materials used in rolling stock supplied to the French railways have recently been thoroughly revised. This revision was carried out jointly by the railways and the principal manufacturers.

Messrs. Dunod have now published them in an entirely new form, thanks to which the user can either obtain only the specifications he has need of, or keep his set constantly up to date. Each specification is published separately and either some or all can be brought together in the holder. New specifications or modifications will be issued as adopted, so that out-of-date specifications can be replaced by inserting the new in their proper place in the holder.

The railways have adopted the standard series of bolts, studs, nuts, washers, split pins, screws, and rivets, standardised by the Standardisation Committee; these are given in a special pamphlet, not numbered with the other specifications, but included in the set.

This work condensed into 218 separate pamphlets is full of important technical information; documents relative to the constituent parts of the equipment will be found therein, as well as new specifications such as, for example, those dealing with the inspection of reinforced concrete pylons for electric lines, portable electric drills, etc...

These last examples show the truly wide scope and the technical value of this publication. R. D.

[621. 392 & 625. 143.4]

CSILLERY (Desider), Oberregierungsrat, Budapest. — **Die Entwicklung der Schienenstosschweissung und das Studium der Geschweissten Schienenstossverbindungen** (*The development of rail joint welding and the study of welded joints*). — Republished from the Review : « Die Elektroschweissung », Parts 1 and 2, 1935. — A pamphlet (11 5/8 × 8 1/4 inches) of 26 pages, with 27 figures. — 1935, Braunschweig, Friedr. Vieweg & Sohn A. G.

Mr. Csillery's note on rail welding describes the results of investigations into the two methods of welding : thermit welding and electric arc welding.

This work has appeared at the right moment, as the welding of rails and the use of long rails are now under consideration on most railways.

The author reminds his readers that tests were made in Hungary some thirty years ago; a section of line about 110 yards long was welded by the aluminothermic process just outside the Budapest Eastern station. The process is now in general use on tramways.

In this very interesting article the author reviews all the points of comparison between the two methods of welding, thermit and electric-arc, and concludes that under the conditions of use considered, arc welding is at least as good as the other method. R. D.